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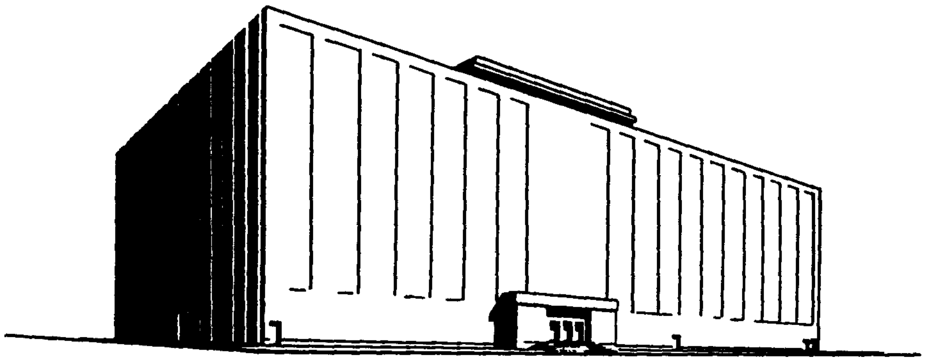
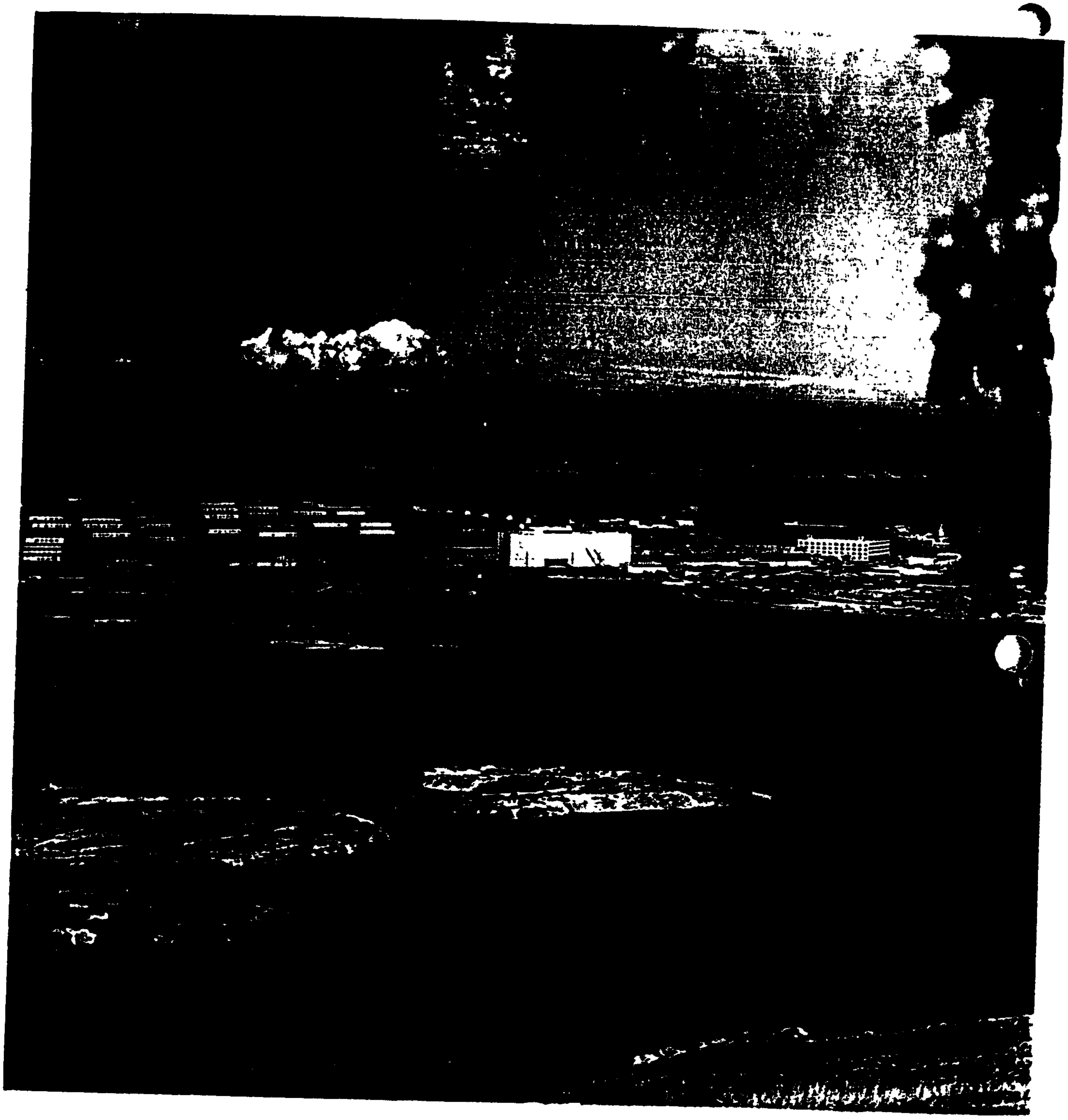


History of U. S. NAVAL RADIOLOGICAL DEFENSE LABORATORY

SAN FRANCISCO CALIFORNIA



HISTORY

OF

THE UNITED STATES NAVAL RADIOLOGICAL DEFENSE LABORATORY

1946 — 1958

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BIRTH OF A LABORATORY

The United States Naval Radiological Defense Laboratory, now housed in a multi-million dollar building in San Francisco, California, has come a long way in twelve years — literally from a handful of pioneers in a "rented room" to a many faceted, versatile staff of 600 in an ultra-modern facility all its own. The need for such a laboratory, although unrecognized at the time, actually dates back to 1942 when a group of scientists in Chicago succeeded in creating the first self-sustaining nuclear chain reaction. Four years later, in July 1946, Operation CROSSROADS, the first nuclear tests held in the Pacific, left no doubt that man was faced with the necessity for coping with strange and unprecedented problems for which no solutions were available. Immediately after CROSSROADS, discussions were held by a group of naval officers in Washington concerning the need for a nuclear laboratory to find those essential answers. The rapidity with which it came into being constitutes everlasting credit to their farsightedness.

In August 1946, the Chief of Naval Operations established a Radiological Safety Program for the Navy that would undoubtedly entail finding a definite location for this work. The main question was whether to use some place already in existence, or set up an entirely new headquarters. By September the target ships used in CROSSROADS had returned to the West Coast, making decontamination of them imperative. Standards were established in October, with about a dozen junior naval officers, who had served as monitors during the tests, carrying out decontamination procedures on a sort of trial and error basis. Headed by a lieutenant commander, this small band formed the Radiological Safety Section (probably the first such group ever organized) as part of the San Francisco Naval Shipyard Industrial Laboratory, with headquarters in two rooms. Their equipment consisted of one coffee pot and six Geiger counters, only two of which worked.

Their problems in decontamination are a story apart, that can best be summed up in the remarks of one of them in retrospect: "We would decide among ourselves how to go about the new type of job, then do it, and then dispatch BuShips and BuMed asking if it were all right to do it that way. If we were right we would dispatch our counterparts in other Shipyards, reassuring them. Anyway, many of the techniques we developed for monitoring and decontaminating ships are still used today."

A letter from the Chief of the Bureau of Ships, dated 18 November 1946, directed the Commander, San Francisco Naval Shipyard to increase already existing laboratory facilities for radiological studies to:

(1) Develop instruments for detection of radioactivity;

(2) Develop equipment for protection of personnel on shipboard;

(3) Develop methods and equipment for decontamination of ships.

The sum of $75,000 was allotted by the Bureau of Ships, for installation, maintenance and operation of equipment. Assignment of an officer to guide the new work was promised. The last sentence of that letter is worth noting — "...It is expected now that these facilities will be utilized for a continuing research and development program." Thus, a new laboratory was born of stark necessity, but even then its prospects for a bright and useful future were foreseen.

Choice of a Site

San Francisco was considered the logical place for the Laboratory for a number of sound reasons, not the least of which was that it is ideal for living. The scarcity of experienced scientific personnel made this a deciding factor. The proximity of two major universities, and the fact that San Francisco was the natural staging point for future Pacific Weapons tests were two more points in its favor. A Shipyard was advantageous for logistic support, and San Francisco Naval Shipyard had already been selected for berthing the CROSSROADS vessels upon which the decontamination methods would be tried.

In Search of a Name

Not until 26 February 1947 did the new Laboratory acquire a name of its own, having previously been referred to as a "laboratory for radiological studies." On that date by Shipyard Order, "The Radiation Laboratory of the San Francisco Naval Shipyard" was established, physically independent of the Shipyard Industrial Laboratory. The order also specified that the Bureau of Medicine and Surgery would utilize these facilities and provide its own officer personnel, equipment and supplies.

Confusion, bound to arise from the similarity in the names of this Navy Laboratory and the University of California Radiation Laboratory, led to a recommendation made to the Bureau of Ships by the Shipyard Commander on 4 February 1948 that the Navy change its Laboratory's name to the "Atomic Defense Laboratory." This suggestion was duly considered by Washington officials and voted down because atomic defense

San Francisco — Glamor City of the West

came under the jurisdiction of the Secretary of Defense, with other Government agencies, such as the Atomic Energy Commission and Public Health Service actively engaged in this field. To use the name "Atomic Defense Laboratory" might imply that this Laboratory was in charge of the atomic energy problems for the entire nation.

Other names discussed were "Naval Radiological Laboratory" and "Naval Radiological Defense Laboratory." Realizing the American propensity for shortening names to initials, those in authority felt that "NRL" could bring further confusion with the Naval Research Laboratory. Consequently, the name "Naval Radiological Defense Laboratory" was selected.

At about the time the final decision was made, two other names were suggested, "Military Radiation Laboratory," and "Radiation Defense Laboratory." Too late ! The official designation had been issued on 21 April 1948 and NAVAL RADIOLOGICAL DEFENSE LABORATORY it was, generally known ever since as NRDL (pronounced "Nurdle"). In September 1950, because it had reached a stage wherein its mission was widely divergent from the Shipyard, the Laboratory was made a separate activity, although still under the command of the Shipyard Commander, and the prefix "United States" was added. Implementation of the directive took place on 1 October 1950.

EVOLUTION OF A MISSION

The first defined mission of the Laboratory was incorporated in its initial report written early in 1947. It stated that "The immediate aim is to provide adequate scientific facilities to fully exploit the opportunities for technical investigations offered by the vessels participating in Operation CROSSROADS."

The broader mission was to "serve as a nucleus for the research and development of the radiological problems of atomic warfare; to furnish a highly skilled organization specifically trained in the naval phases of these problems; and to supply and collect technical information and data needed in training of military and civilian personnel to meet radiological problems of the future."

A year later in March 1948, the mission was reworded thus: "To conduct investigations and develop information concerning effects and consequences of dispersed fissionable materials, fission products or other radioactive substances." This was interpreted to include:

(1) Estimation and evaluation of hazards.

(2) Investigation of all phases of decontamination.

(3) Means of minimizing contamination and personnel risks.

(4) Establishment of safety procedures.

(5) Establishment of tolerance levels.

(6) Determination of toxicities and metabolism of radioactive substances.

(7) Necessary basic research in connection with the above.

In 1949 a bit more was added "...other radioactive substances present and resulting from nuclear processes on vessels, in harbors and anchorages, and in shore establishments and the corrective measures therefor."

In 1950 the mission was further revised to read: "Conduct basic and applied research and development concerned with the radiological safety program of the Armed Forces; investigate the effects and consequences of dispersed fission products, fissionable materials, and other radioactive substances present and resulting from nuclear processes on ships at sea, in harbors and anchorages, and in shore establishments; and determine and develop corrective measures for the foregoing."

On 1 November 1955, a Notice from the Secretary of the Navy contained the concise mission which, except for substitution of the word, "nuclear" for "atomic," still exists. Thus, the mission now reads:

"Conduct basic and applied research on the physical and biological effects of hazardous nuclear and thermal radiation, including interrelated effects such as shock or blast, and the dispersion and contaminating effects of fission products resulting from a nuclear explosion or from controlled nuclear processes; develop and evaluate Radiac devices and shielding equipment or materials for protection of personnel, reclamation or decontamination procedures for shipboard, aircraft, and land areas; preparation of data for training information required by the military services, including assistance to other federal agencies and government contractors in the fields of nuclear and radiological warfare; and develop the use of radioisotope and other tracer techniques in the above technological fields."

The detailed mission follows:

Conduct basic and applied research in the following categories:

(1) Characteristics of hazardous radiations and radioactive materials; including characteristics of thermal, nuclear and radioactive particulate fallout and radioactive materials or contaminants, including biological effects.

(2) Personnel hazard from nuclear and thermal radiation and radioactive materials, including biological effects.

(3) Appraisal of effectiveness and countermeasures in the field of nuclear warfare.

(4) Development and appraisal of radiac instrumentation including basic supporting research for various kinds of radiation hazard from a nuclear detonation.

(5) Development and evaluation of personnel protection materials and measures from radiation hazards and contamination in nuclear warfare.

(6) Nature of radioactive contamination of materials, and development of protective and reclamation procedures.

(7) Investigations in all general problems in radiological defense, including participation in nuclear weapons tests in fields related to the above categories.

(8) Act as a primary consultant and adviser in the field of defense against nuclear weapons and protection in nuclear processes to all branches of the Defense Department, and as occasional consultant to the Atomic Energy Commission, U. S. Public Health Service, civil defense organizations and others.

(9) Preparation of training manuals and other instructional material in the field of radiological defense for the Defense Department.

Thus, it will be seen that from the narrow field of decontamination studies has evolved a well rounded mission incorporating investigations in biology, radiation instrumentation, radiochemistry and other challenging facets of the problem. As a matter of fact, the mission of this Laboratory is so extremely broad that it transcends the idea of research for military use only, since nuclear radiation does not differentiate between the wearers of uniforms and those of civilian clothing, but embraces all mankind.

Unlike the majority of military laboratories, emphasis at NRDL is laid not upon output of "hardware," but of knowledge — basic scientific knowledge in the form of technical reports and memoranda; military knowledge in the form of tactical doctrine, manuals, procedures; knowledge for Civil Defense in the form of plans, systems and reports. The "hardware" output of the Laboratory — radiac instruments — constitutes only a small portion of the work.

Decontamination by water — NRDL's first task

ORGANIZATION

Early in 1947 a simple organization chart was proposed, set up in terms of people instead of units:

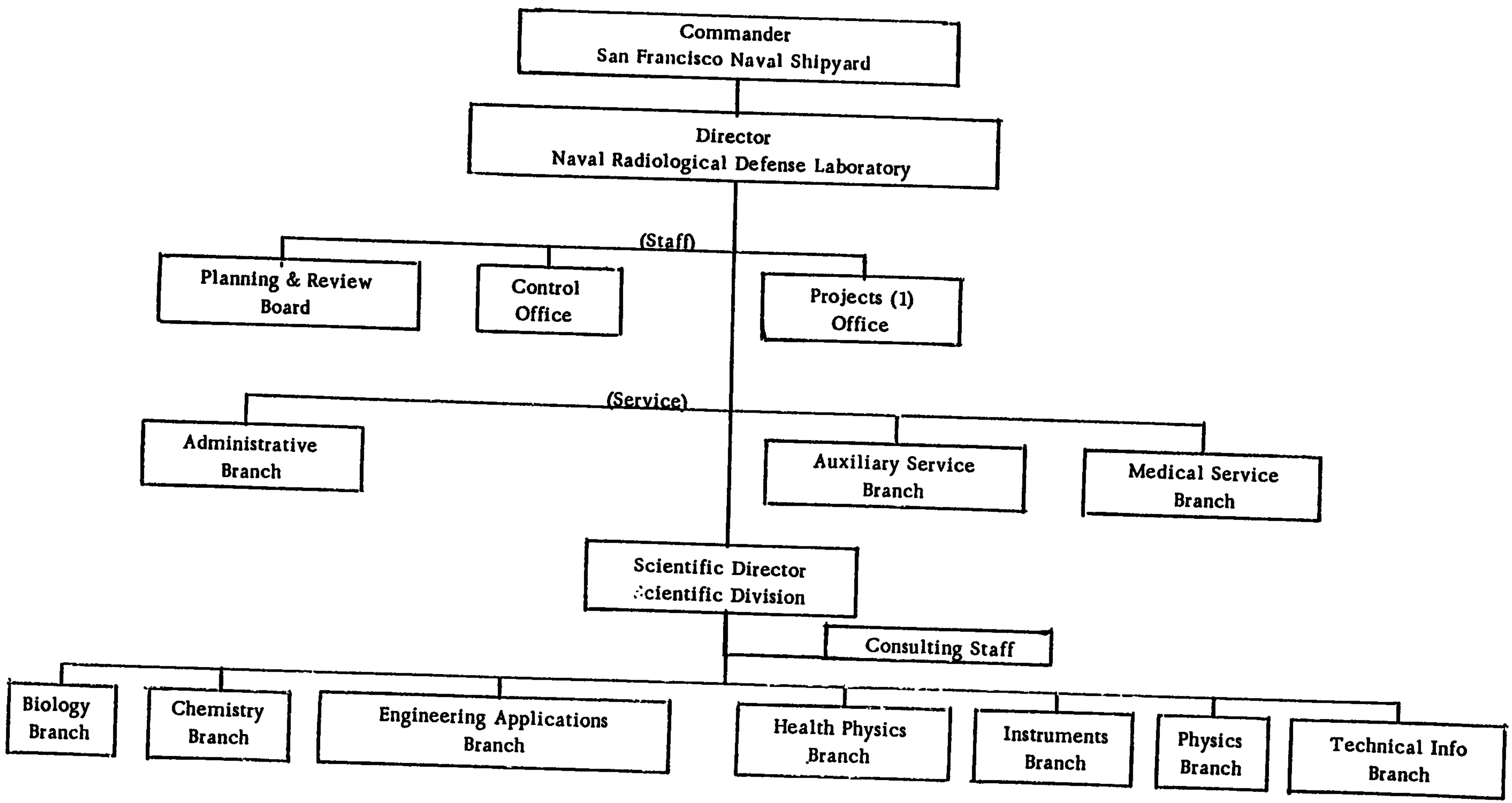
NAVAL PERSONNEL	CIVILIAN PERSONNEL
Officer-in-Charge	Technical Director, P-7
Monitoring Officer	Physical Chemist, P-6
Training Officer	Physicist, P-5
Instrumentation Officer	Chemist or Chemical Engineer, P-5

This was soon expanded to include several research associates, technical assistants, and service groups under an administrative assistant, a library, glass shop, stock room, etc. Within a year, the scientific organization was set up, designating eight divisions: Auxiliary Services, Biology, Chemistry, Engineering Applications, Health Physics, Instruments, Physics and Technical Information and Materials. On 1 October 1948 the designation of Technical Director was changed to Scientific Director, a title still in effect.

The first formal organization chart is dated 1 July 1949 (see page 7) Comprising only a single page, it shows a Commanding Officer, a Director with a Projects Office, Control Office and Planning Review Board serving as his staff; a Scientific Division with seven branches and a Consulting Staff under a Scientific Director; and a Services Division composed of Administrative, Auxiliary and Medical branches. The Auxiliary Services Branch originally assigned to the Scientific Division was shifted to this service group.

Survey Predicts Growth

Of interest is a report by the Office of Industrial Survey in November 1949, recommending that, since it was the only activity known to be engaged in studying the problems associated with radiological contamination, full consideration be given to the obvious future growth of the Radiological Defense Laboratory. It would undoubtedly be called upon to conduct specific investigations by the various Services and later, the results obtained would find ready use by Civil Defense organizations.



Notes:
(1) includes
Army Corps of Engineers
Bureau of Aeronautics
Bureau of Medicine & Surgery
Bureau of Ships
Bureau of Yards and Docks
Army Chemical Corp

Organization
Naval Radiological Defense Laboratory
Date 1 July 1949

Because of this wide scope, the report urged that funds for laboratory overhead should not be drawn from a single agency, but should be included in the allotments made for specific projects by participating agencies.

The report went on to say that the proposed conversion of a Shipyard building would not prove adequate for the expanding Laboratory, and that use of this building would interfere with the industrial mobilization of the Shipyard. "In the opinion of this Office," it stated, "a laboratory of the size and scope that this one will eventually reach has no place within the confines of an industrial activity." Further recommendation was made that the Laboratory be established as a National Laboratory. No action was taken on these proposals.

NRDL Departmentalized

At the beginning of 1951 the Laboratory was divided into departments and organizational codes assigned--Scientific Department with four divisions to conduct research in different areas of radiological defense: Biological and Medical Sciences, Chemical Technology, Nucleonics, and Special Operations Divisions; Administrative Department, composed of service groups to support the scientific research: Technical Information, Engineering Services, Materials and Accounts, and Administrative Services Divisions; Management Engineering Department for control of financial, space, facilities and disaster control; Organization and Methods, Budget and Facilities Engineering Divisions: and Medical Services Department to be responsible for the health programs and for administration of all naval medical personnel to make them available to the research program: Radiological Health and Photodosimetry Division. The Director's Staff was composed of the Project Officers, Industrial Engineering Officer and Personnel Assistant.

Each division was divided into branches and sections with functions defined on the multi-paged chart. Few deviations from that basic organization have since occurred. Major changes include: Special Operations Division abolished; Military Evaluations Group assigned to the Scientific Director's staff and later designated as Military Evaluations Division; reorganization of the Administrative Services Department which was redesignated Technical-Administrative Services Department, and later split into Technical Services Department and Administrative Department; Comptroller organization established to conform to a new Navy Department concept bringing together accounting, budgeting and management engineering functions; Chemical Technology Division reorganized (with greater emphasis on fallout) and a Field Test Group added; Security Branch combined with Communications to form a division; and Nuclear Radiation Shielding Branch, formerly a section in Nuclear Radiation Branch, established.

Other adjustments have taken place and still more will be incorporated in the Laboratory's organization — all aimed toward a progressively better coordinated activity. It is interesting to compare the first elementary chart with the current over-all chart of the Laboratory's organization. (See page 10)

Boards and Committees — Internal

In lieu of a more detailed organization, special boards and committees were formed in February 1948 to carry out various important functions. These included Committees for Radiological Safety, Library, Personnel, Education, Seminars, and Planning and Review. The latter was changed to a Board in August 1948 and incorporated an Executive Committee, later termed the Research Council.

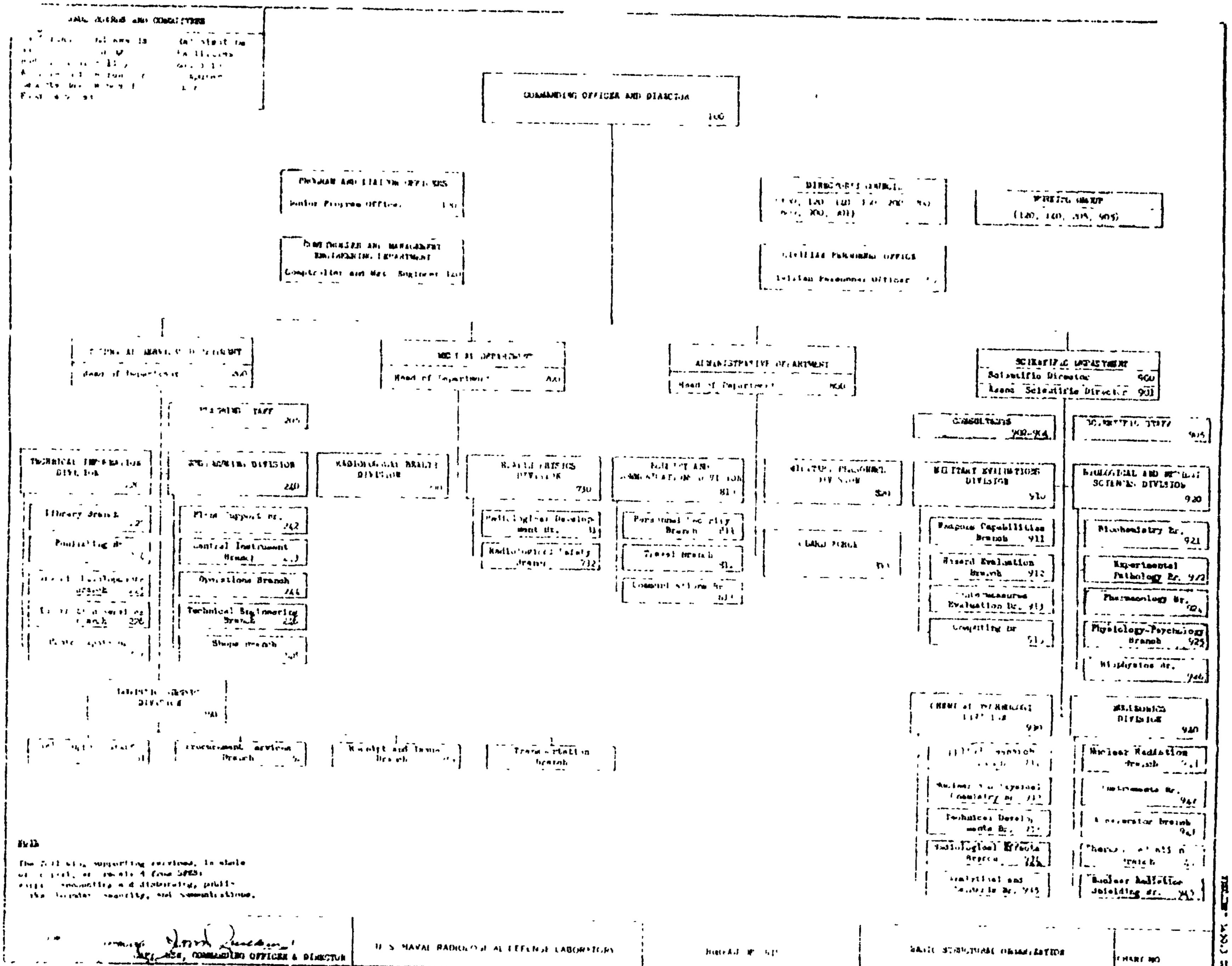
Through the ensuing years, although a more complex organization has been developed, a definite need remained for special groups from different units to pool ideas and disseminate information to all segments of the Laboratory. Following are the boards and committees set up at various times, but still in existence:

Reports Review Board. (7 members) Originally review of reports was mainly the responsibility of the Special Assistant to the Technical Director. In June 1954 the Reports Review Board was established, chairmanned by the Scientific Director or Associate Scientific Director and composed of certain key members of the Laboratory. Since its organization this Board has reviewed a total of 566 reports.

Performance and Incentive Awards Board. (7 members) These functions were originally performed by two separate groups — the Performance Rating Board and the Committee on Awards. The two were amalgamated in 1958. Members are appointed by the Commanding Officer and Director from different departments each year.

Food Services Board. (5 members) The need for this body arose in 1955 when the Laboratory became united in one building. A rotating membership, appointed by the Commanding Officer and Director, formulates and effects plans for the operation of food services within the Laboratory.

Education Committee. (6 members) It has always been the policy of the Laboratory to encourage increased competence of its professional members. From the start a committee on education has served as a planning and advisory group in educational programming. The first such group also arranged weekly seminars, a function relegated to individual units as the Laboratory grew in numbers. Members of the Education Committee are appointed by the Commanding Officer and Director to serve one year.


COMMANDING OFFICER AND DIRECTOR
100
Senior Program Officer
Scientific Director 900
Head of Department
Training Staff
Military Evaluations Division 910
Weapons Capabilities Branch 911
Hazard Evaluation Branch 912
Biochemistry Br. 921
Experimental Pathology Br. 922
Pharmacology Br.
Physiology-Psychology Branch 925
Nuclear Radiation Branch
Instruments Br.
Radiological Effects Branch
Nuclear Radiation Shielding Br.
Library Branch
Operations Branch
Technical Engineering Branch
Shops Branch
Personnel Security Branch
Travel Branch
Procurement Services Branch
Transportation Branch
U. S. NAVAL RADIOLOGICAL DEFENSE LABORATORY
COMMANDING OFFICER & DIRECTOR
BASIC STRUCTURAL ORGANIZATION
CHART NO

Radiological Policy Committee. (7 members) This is an outgrowth of the Radiological Safety Committee established in the first months of the Laboratory's existence. Members are appointed for an indefinite term by the Commanding Officer and Director from nominations by division or department heads. All policies and procedures are formulated by this committee which also serves as a reviewing board for cases of radiological exposure in excess of the maximum permissible limit.

Radioisotope Committee. (5 members) This group, set up as required by the Atomic Energy Commission, determines that proposed use of isotopes is required and that adequate facilities exist to handle the material. Membership is composed of heads of scientific divisions

Employees' Council. Established in 1957, this group primarily constitutes an avenue of communication between management and employees.

Welfare and Recreation Committee. (9 members) This committee occupies a semi-official position in the Laboratory. It is described later in this history under the heading of Informal Organizations.

Computer Scheduling Committee. This committee, composed of six members, was established in February 1958 to resolve questions of priority for programming in connection with the Laboratory computer.

Boards and Committees — External

In addition to its own internal committees, the Laboratory participates in the operation of other important groups.

Civil Service Board of Examiners for Scientists and Engineers in Pasadena, California. NRDL provides two senior scientists and the Civilian Personnel Officer as members of this Board.

Rating Panel for the Pasadena Board. Members of this panel assist the Civil Service Commission in rating certain types of scientific engineering and subprofessional applications to determine qualifications for placement in Navy laboratories. NRDL has 12 members on it.

San Francisco Naval Shipyard Board of Examiners. This Board is primarily concerned with ungraded employees. One member from Civilian Personnel Office represents the Laboratory.

Inter-Laboratory Committee on Facilities. NRDL joined this committee of West Coast Naval Laboratories in March 1952. Purpose of the Committee is to promote cooperation between the members in use of special or unique facilities and services and available talents. As a result

of the Committee's work the Laboratory has made profitable use of the facilities of other members and has been able in turn to help them.

COMMANDING OFFICERS

From the beginning, the Laboratory has been under the direction of a naval officer. Fortunately, its leaders have been men singularly well equipped to head a research organization, several of them having had extensive experience in various aspects of atomic energy work. First "Officer-in-Charge," the title within a few months was changed to "Director." When set up as an activity separate from the Shipyard the Director was accountable to a Commanding Officer who was also the Commander of the Shipyard. It was not until 16 September 1955 that, "in the interests of good management and in recognition of the separate identities of the two activities" the billet designated as Director was changed to Commanding Officer and Director. The Laboratory thus became a completely independent command.

The chronological record of NRDL commanders follows:

OFFICER - IN - CHARGE

LT Roger G. Preston	2 February 1947	- 2 May 1947

DIRECTOR

CDR John J. Fee	2 May 1947	- 18 July 1950
CAPT Joseph L. Bird	18 July 1950	- 17 July 1953
CAPT Robert A. Hinners	17 July 1953	- 16 Sept. 1955

COMMANDING OFFICER AND DIRECTOR

CAPT Robert A. Hinners	16 Sept. 1955	- 15 August 1956
CAPT Richard S. Mandelkorn	15 August 1956	- 30 July 1957
CAPT Floyd B. Schultz	30 July 1957	- 28 October 1957
CAPT John H. McQuilkin	28 October 1957	-

Brief Biography of Current Commanding Officer and Director

Captain John Howard McQuilkin, was born in Washington, Indiana but grew up in Baltimore, Maryland. Before entering the Naval Academy he attended Polytechnic Institute and the Severn School. After graduation near the top of the Class of 1935, U. S. Naval Academy, and two years at sea aboard the USS SARATOGA, he began postgraduate study of naval construction at the Massachusetts Institute of Technology. The three-year course culminated in a Master's Degree. This was followed by three years at Mare Island Naval Shipyard, where he worked in Design, Ship Superintendent and Planning Departments. Late in 1943 he was ordered to the Staff of Commander Destroyers, Pacific Fleet as Material Officer. From 1946 to 1950 he was assigned to the Bureau of Ships Hull Design Division, with an additional year as Assistant Director of Standardization in the Office of the Chief of Naval Operations.

Captain McQuilkin had his first contact with atomic energy at the Bureau of Ships, prior to 1950 when engaged in the design of nuclear weapons installations on naval ships. As Deputy Chief of Development (1951 - 1954) Armed Forces Special Weapons Project Field Command, Sandia Base, New Mexico, he was in close contact with nuclear weapons tests which afforded good background for his present assignment.

In April 1955, after a return to Mare Island for a year as Repair and Shipbuilding Superintendent, he was again assigned to Ships Design Division of the Bureau of Ships where he stressed the need for development of design standards to include protection against the effects of nuclear weapons on Navy Ships. His ten years' work in ship design included nuclear propulsion, especially during the years just prior to his assuming command of the Laboratory, when he was intimately concerned with the design of nuclear propelled submarines and aircraft carriers.

Captain McQuilkin received the Bronze Star Medal for World War II service. Since taking command of NRDL he has received a Letter of Commendation with Ribbon and Metal Pendant from the Secretary of the Navy, for achievements in ship design at the Bureau of Ships. His campaign medals include American Defense, American Theatre, Pacific Theatre, Philippine Liberation, World War II Victory, National Defense Service. He is a member of Sigma Xi, the Society of Naval Architects and Marine Engineers and the American Society of Naval Engineers. He is married and has two children.

SPONSORSHIP

NRDL has never lacked enthusiastic backers. Even before it was established, the Office of Naval Research evinced a definite interest, informally offering assistance in obtaining personnel and in liaison with other agencies, and financial responsibility for "a separate organization supported by the Office of Naval Research." Other Navy bureaus also were enthusiastic, and emphasized that all Navy activities with a stake in the operation should cooperate to make it a success.

NRDL COMMANDING OFFICERS

LT Roger G. Preston

CDR John J. Fee

CAPT Joseph L. Bird

CAPT John H. McQuilkin

CAPT Robert A. Hinners

CAPT Richard S. Mandelkorn

CAPT Floyd B. Schultz

As part of the Radiological Safety Program created by the Chief of Naval Operations in August 1946, the Bureau of Ships had been given certain responsibilities for developing the means and techniques for carrying out that program. The logical outcome of the undertaking was that BuShips should become the Laboratory's parent organization. Because of the inherent biological hazards, the Bureau of Medicine and Surgery also had an obligation to fulfill in studying those hazards associated with decontamination. Beginning early in 1947 other Navy Bureaus which had already been assigned work in certain development aspects of the Rad-Safe program offered cooperation and financial support to the new Laboratory. By mid-year the Bureau of Yards and Docks and the Bureau of Aeronautics joined in the sponsorship, and as soon as the program was well under way, ordered officers to represent them at the Laboratory.

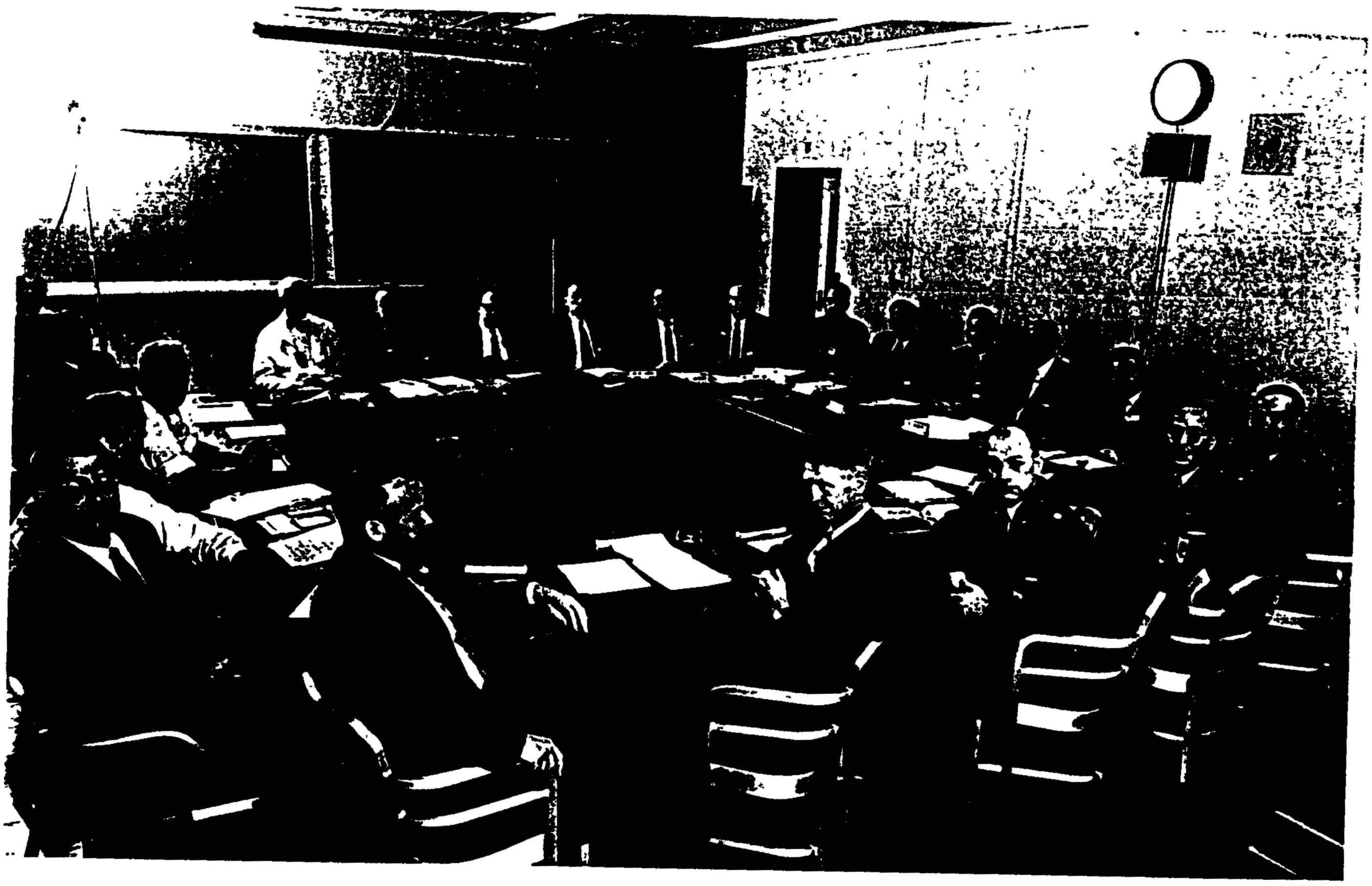
In August 1947 a joint BuShips-BuMed letter to the Atomic Energy Commission requested that certain information in fields relating to radiation be made available to the Laboratory from the AEC's storehouse of valuable knowledge gleaned from the Manhattan District, in order to avoid needless duplication of effort and to insure prosecution of the vitally important research by correct procedures. About the same time the War Department's Corps of Engineers became interested in the Laboratory and proffered support. An Army engineering officer was assigned as Project Officer, and, because he was the Senior Project Officer, served as the Deputy Director of the Laboratory for several years.

A few months later the Armed Forces Special Weapons Project, the Army Chemical Corps and the Air Force supported certain phases of the Laboratory program, and eventually set up billets for their own project officers to make available to the Laboratory "such information and assistance as may be useful in the solution of its specific problems," in certain enumerated categories and with certain stipulations as to procedures and clearances. Later additions to the sponsor list were the U. S. Public Health Service (1950) and the Federal Civil Defense Authority (1951). For a brief time in 1951 - 52 the Nuclear Energy for Propulsion of Aircraft Project (NEPA) sought to learn the physiological effects of short term exposures to high levels of nuclear radiation, such as that of a power pile.

Almost a Tri-Service Laboratory

A memorandum in December 1951 from the Assistant Secretary of Defense to the Research and Development Board (RDB) suggested that, owing to interservice interest in NRDL and the necessity for joint funding of programs, the Laboratory might well be treated as a joint agency of the Department of Defense. The memorandum also suggested that a proposed Air Force Laboratory at Bedford Massachusetts might be combined with NRDL for such a joint agency. In reply, the RDB expressed strong approval of NRDL "under present conditions of sponsorship and

Meeting with a Sponsor — Army Technical Services



operations," and stated that the program planned for the Air Force Laboratory would not materially affect the need for the NRDL facility. "The program demands on NRDL," it said, "have been increasing since its inception. The ever-increasing extent and variety of atomic energy applications in military operations leave little doubt as to the future need for such a facility."

The Air Force Laboratory did not get approval of the RDB, and consequently expressed interest in greater participation in NRDL's biomedical program. The next discussions of NRDL's future concerned its becoming a medical laboratory concentrating on biological and chemical warfare fields. In 1953 there was more discussion on the tri-service status, providing that funding and staffing agreements could be reached. The Air Force showed little interest, but in 1954 the Army entered into certain terms of agreement for a joint Army-Navy program, with the Laboratory remaining under Navy management. In general these terms still govern Army participation in the Laboratory program.

In 1956 the Project Officers of military sponsors were redesignated Program Officers, and the current staff has officers representing all of the Armed Forces.

PERSONNEL

Initially the staff was composed of a few naval officers and enlisted men who had formed the Radiological Safety Section of the San Francisco Naval Shipyard. Currently the military complement,exclusive of the Program Officers, includes physicians, members of the Medical Service Corps, Hospital Corps and Supply Corps, WAVES, engineers, aviators, civil engineers, and regular line officers.

From the very beginning, however, it was recognized that the Laboratory would eventually be predominantly civilian in nature, and four days after the initial Laboratory for Radiological Studies was established, details of personnel requirements were spelled out, even to the types of degrees demanded and the specific duties to be assigned key civilians, particularly the Technical Director. Pending establishment of Civil Service positions, it was suggested that technical personnel be engaged on personal service contracts to avoid delay.

One of the most vexatious problems that beset the new Laboratory was the acquisition of qualified technical personnel. Finding competent civilian scientists presented a real dilemma. The first "Progress report" (early in 1947) stated that "to staff the Laboratory with inefficient and untrained civilian personnel simply to fill the required ratings would be

a serious mistake which would immeasurably handicap the growth, progress and prestige of the Laboratory." Therefore, it was recommended that all key civilians be employed on a trial basis and that special care be observed in selection of the Technical Director, perhaps using the consultant basis of employment.

In addition to the original eight key members, six laboratory technicians with undergraduate degrees at the P-2 level and two assistants for routine laboratory work were included. (At that time, the Civil service "Professional" (P-1, etc.) designation was in use, later supplanted by the General Schedule (GS-, etc.) system.

Actual hiring of civilians began in March 1947. Within a year, the Laboratory roster showed a total of 142, subdivided into: 15 officers, 20 enlisted men, 56 professional civilians, 18 sub-professionals, 33 administrative, clerical and fiscal. Included in the officer list were project officers from participating agencies. At that time (1948), it was estimated that the maximum ever to be reached would be 100 professional, 100 non-professional and 40 military with allowance for 50 percent increase if required in emergency.

Unpredicted Growth

In less than a year, the number had climbed to 188 and in a few months (July 1949), the 200 mark was reached, with 125 employed directly on projects and 75 in supervisory, administrative and support capacity. By March 1950, total strength was 250, about 100 short of the number necessary for full prosecution of the assigned program. The Korean conflict had a rapid effect on hiring at the Laboratory. In about six months, the roster was noticeably increased and by March 1952, the total was 612, a number that remained more or less constant until 1957 when a Department of Defense "belt tightening" made slight inroads. Since then, the number of employees at NRDL has hovered between 575 and 600. On 1 August 1953, NRDL assumed responsibility for its own appointing authority and all civilian personnel functions were transferred from the Shipyard.

The scientific staff is now as diversified as the program and includes: chemists (organic, theoretical, analytical, physical, radiological); physicists (nuclear, thermal and theoretical); health physicists; engineers (chemical, electrical, electronic, mechanical, civil; mathematicians and computer programmers); operations research analysts; metallurgists; physiologists; biochemists; biophysicists; psychologists; medical doctors; pathologists; bacteriologists; hematologists; etc. Some of these are members of the Armed Forces, and many of the Laboratory technicians are hospital corpsmen.

Support Personnel

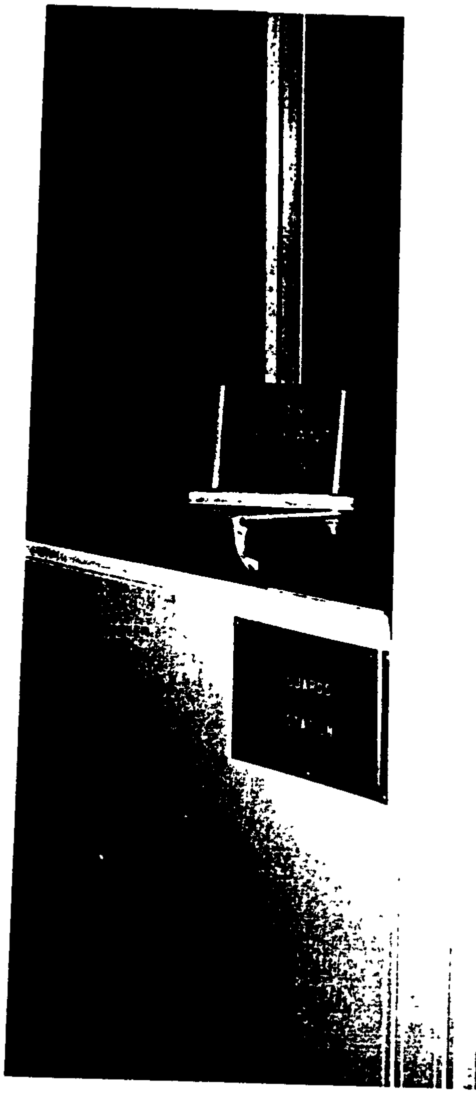
Experimental Machine Shop personnel manufacturing research apparatus


CAUTION

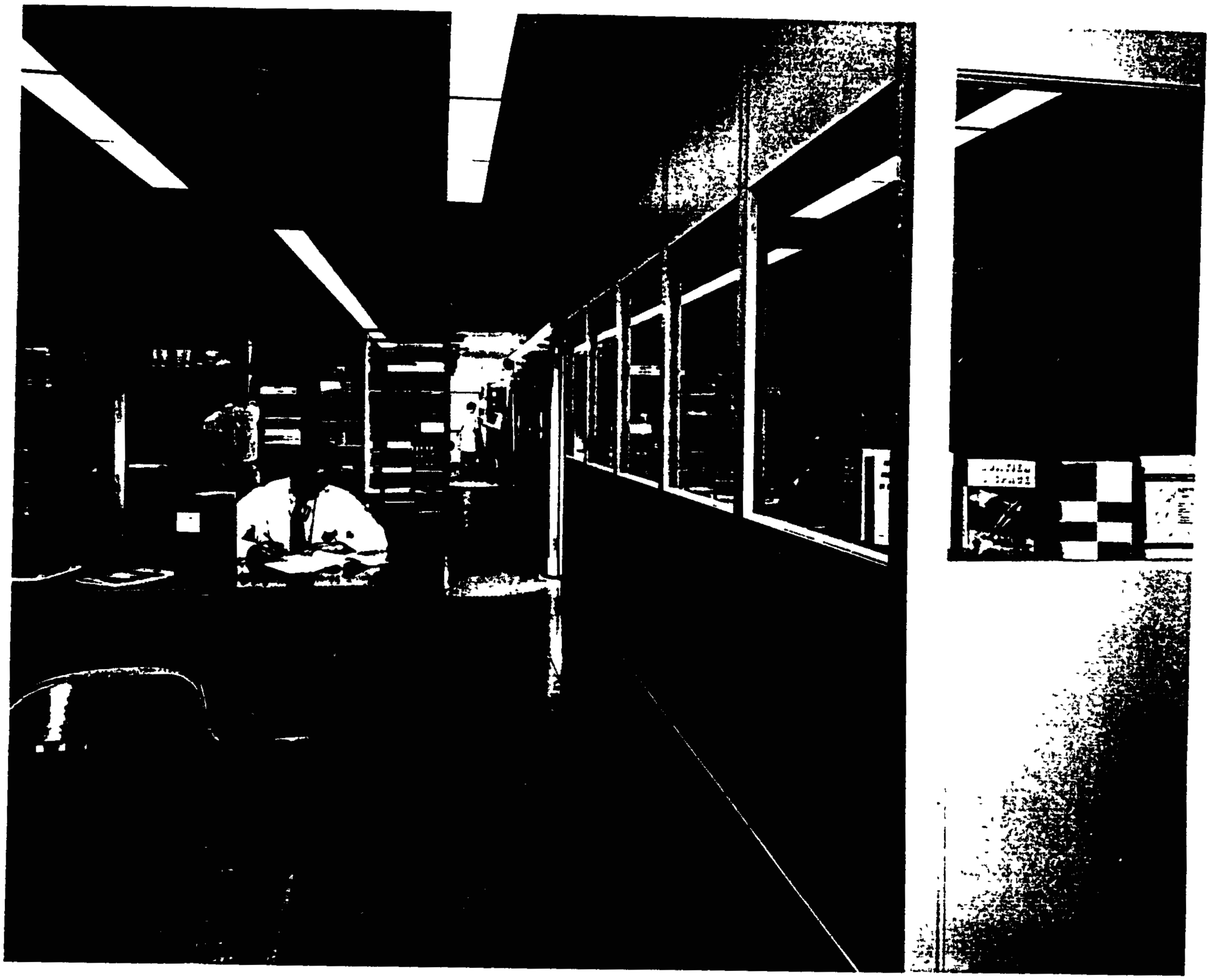
Support Personnel

Graphic Arts Branch — Illustrators and designers of Laboratory technical reports, exhibits and presentations

Support Personnel
Guard at Alarm Panel that registers failure of any vital power function of the building



Support Personnel
A view of the Library stacks



In the support capacity are: laboratory assistants; administrators; technical publications specialists; illustrators; engineers; librarians; clerical workers; photographers; mechanics; experimental machinists; electricians; glass technologists; draftsmen; and specialists in communications, information, training, supply, and transportation.

Academic degrees held by members of the Laboratory are:

BA or BS	175
MA or MS	55
PhD	48
MD	6

Management personnel to the level of Division Head are:

SCIENTIFIC DEPARTMENT

Scientific Director	Dr. Paul C. Tompkins
Associate Scientific Director	Dr. Eugene P. Cooper
Assistant Scientific Director	Mr. Robert C. Lilly
Consultant to the Scientific Director	Dr. Claude R. Schwob
Statistical Consultant	Miss Marion Sandomire
Medical Consultant	Dr. Robert R. Newell
Head, Biological and Medical Sciences Division	CAPT Albert R. Behnke, Jr. (MC) USN
Head, Chemical Technology Division	Dr. Edward R. Tompkins
Head, Nucleonics Division	Dr. Andrew Guthrie
Head, Military Evaluations Division	Mr. Walmer E. Strope

COMPTROLLER AND MANAGEMENT ENGINEERING DEPARTMENT

Comptroller and Management Engineer	Mr. James E. Carroll

CIVILIAN PERSONNEL OFFICE

Civilian Personnel Officer	Mr. C. Bruce Moyer

MEDICAL DEPARTMENT

Radiological Medical Director	CAPT Albert R. Behnke, Jr. (MC) USN
Head, Radiological Health Division	LT Walter L. Taylor (MC) USN
Head, Health Physics Division	Mr. Albert L. Baietti

TECHNICAL SERVICES DEPARTMENT

Technical Services Director	CDR Jack A. LaSpada, USN
Head, Technical Information Division	Mr. Thomas J. Mathews
Head, Engineering Division	Mr. Valentine Franz, Jr.
Head, Logistic Support Division	LT Wellard R. Guffy, (SC) USN

ADMINISTRATIVE DEPARTMENT

Administrative Director	LCDR Clyde O'G. Morrison USN
Head, Military Personnel Division	LCDR Joseph S. Kelly (MSC) USN
Security & Communications Division	LT M. K. Romani (W) USN

Brief Biography of the Scientific Director

Dr. Paul Carter Tompkins is a native of Walla Walla, Washington, where he lived until he finished Whitman College, a chemistry major. Graduate study at the University of Chicago followed, and after a year or so he transferred to the Department of Biochemistry at the University of California to continue work for his doctorate. There he served as a teaching assistant until his PhD in biochemistry was received in 1941. The next two years he spent at Stanford conducting research in the development of a new method for measuring the stability of serum albumin from blood plasma.

Dr. Tompkins became affiliated with the Manhattan Project at the Metallurgical Laboratory in Chicago in 1943, working with the production of plutonium as the source material of the atom bomb. This was followed by his assignment as group leader, later senior chemist, in the Radiochemistry Section of Oak Ridge National Laboratory, Tennessee, his research concentrated on biological applications of radioisotopes and in the development of safe procedures for handling radioactive materials. He is an acknowledged expert in both these fields.

After four years at Oak Ridge, Dr. Tompkins came to NRDL, first as advisor to the Scientific Director, then as Associate Scientific Director in charge of the Laboratory's participation in Operation GREENHOUSE. In June 1951, Dr. Tompkins was appointed Scientific Director following the resignation of Dr. William H Sullivan, the first Scientific Director who had joined the Laboratory in January 1948.

Dr. Tompkins has a great many scientific publications to his credit and is active in such scientific societies as The American Chemical Society, Sigma Xi, AAAS and the American Industrial Hygiene Association. He served as consultant to the Joint Committee on Atomic Energy in connection with Congressional Hearings in 1957 on the nature of radioactive fallout and its effects on man.

The Scientific Director – Dr. Paul C. Tompkins

FACILITIES (Buildings)

From the "rented room" in the San Francisco Naval Shipyard, the embryonic Laboratory moved into Building 506, formerly occupied by the Shipyard Dispensary and described in the first Laboratory report as having "spaciousness and a floor plan ideal to accommodate the proposed personnel and equipment — at least for a 6-month development program." In the 9,711 square feet, there were two chemistry laboratories, a photographic dark room, several counting rooms, administrative and personnel offices, personnel decontamination room, a few store rooms, an instrument repair room, the library, and an assortment of other offices — a grand total of 27 rooms, all very small.

Even then, it was realized that any expansion would demand larger quarters, and by March 1948, two more buildings, 507 (an ex-barracks) and 510 (ex-Warrant Officers' Mess) brought the total floor space to 24,000 square feet. The animal colony was housed in 507, along with Health Physics, the Decontamination Center, Medical Services, and part of Supply. In Building 510, Physics, Auxiliary Services, Instrumentation, and the rest of Supply fell over one another.

Within a few months, the Laboratory had spilled over into several other Shipyard buildings, the largest being Building 351 (with 40,000 square feet of floor space). Some of the other buildings were quonsets devoted to instrumentation. Total floor space was now approximately 70,000 square feet. With the accelerated expansion of projects assigned the Laboratory, the need for space and more space increased. In the end, some 20 Shipyard buildings were gobbled up and it was necessary to construct two annexes to Building 351. Floor space now added up to 102,000 square feet.

New Building Becomes Reality

This growth precipitated an urgent need for a central building to collect most of the workers under one roof, and in 1950, the Bureau of Ships was requested to approve construction of a four-story building that would cost about $5,000,000.00. In January 1951, Representative Franck Havenner (Dem. - Calif.) introduced in the Congress HR1196 to appropriate $7,800,000.00 for construction of a permanent home for the Laboratory. In October 1951, the Laboratory was included in the Military Construction Bill for $8,580,000.00, and an office was set up for the architect Leland S. Rosener in Building 508 to begin designs to be coordinated by the Management Engineering Department.

When the plans were finished, progress was rapid. Bids from nine firms were completed on 9 June 1952, and two weeks later, the contract was awarded jointly to Contractors Rothschild, Weirick and Raffin and

Ground-Breaking by Rear Admiral Homer N. Wallin, USN

James I Barnes. The next move was to clear the site adjacent to the South Gate of the Shipyard, then occupied by the Navy Commissary Store.

All was in readiness within a month and on 30 July 1952, ground for the long-awaited building was broken by RADM Homer N. Wallin, USN, then Chief of the Bureau of Ships.

At the ceremony witnessed by a number of high ranking officers and scientists, Admiral Wallin spoke prophetically of the importance of the contribution of the Laboratory. "It is the only laboratory of this kind in the world." he said, "and is important not only from the viewpoint of warfare, but also for its humanitarian aspects. Certainly much of the information necessary for the utilization of atomic power will have to come from this Laboratory, and its importance to industry will become greater and greater..."

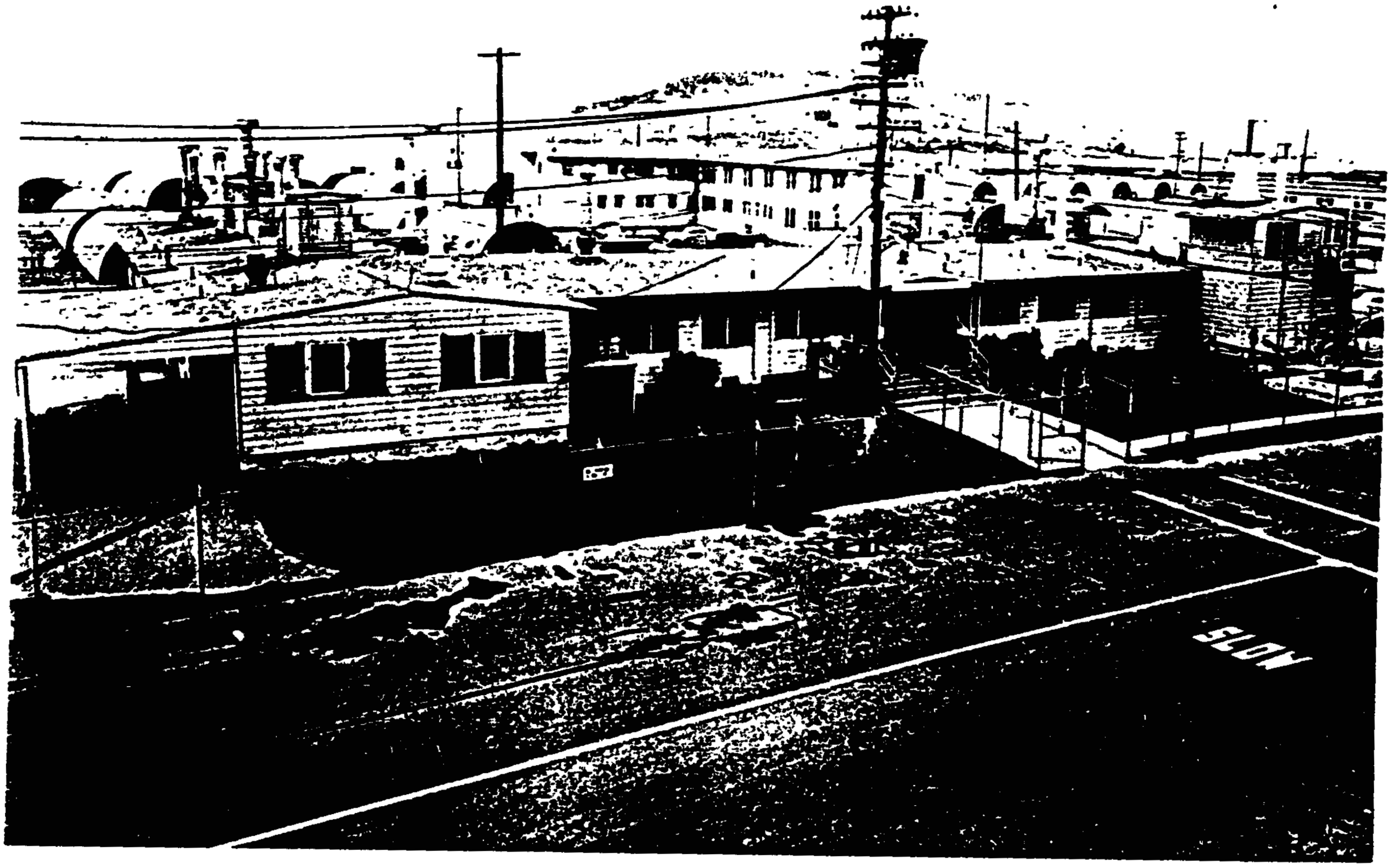
Features of the New Building

The unique building for a just-as-unique activity has six stories of steel and reinforced concrete, with overall dimensions of 400' x 100' and floor space of 282,000 square feet, nearly 30 times as great as the Laboratory's initial space! There are no windows except at the entrance and in the roof-top cafeteria. The omission of windows was an economy measure with several other advantages. Greater useable space is provided the laboratories, adding about 10 percent wall space, and making placement of furniture and fixtures more flexible. Illumination is more uniform and temperatures can be kept more constant (an important item with experimental animals). Greater protection is afforded from blast, in fact, the Laboratory is considered a Class I shelter, capable of protection from radioactive fallout and blast over-pressures up to 10 pounds per square inch. In lieu of windows, the interior is made cheerful with pastel walls, the shades chosen for harmony and habitability to produce a pleasant atmosphere in which to work.

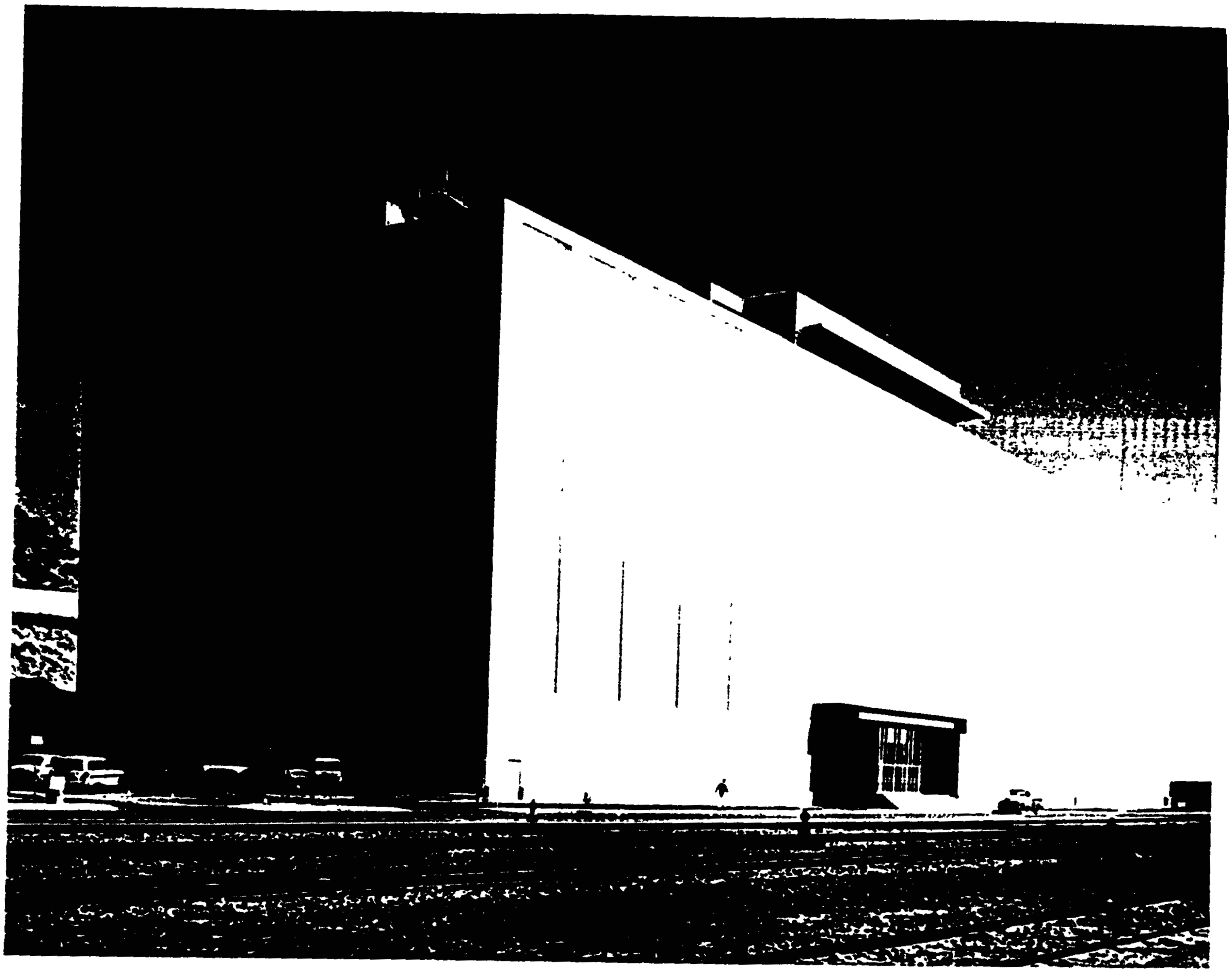
Other modern features include: interior walls of pressed metal, movable to facilitate relocation as necessary; asphalt tile floors; escalators for easy movement among floors; passenger and freight elevators; and specially designed ventilation, with independent systems for each floor to aid in maintaining a uniform pressure balance. Fibre glass and chemical filters are used in the exhaust system in certain areas; the 274-seat auditorium and the cafeteria have air circulating systems completely isolated from the main system.

Adjacent to the main building is a smaller one of similar construction which, completed in 1954, houses the 2-million electron volt Van de Graaff electrostatic accelerator. This building is also completely air conditioned, two stories high, divided into ten rooms, with the generator

Laboratory Buildings — The First Home


SLOW

The New Laboratory Home



on the upper floor and the target room, experiment area, laboratories, control console, machine shop, office and rest rooms on the lower floor. A 4-foot thick, 30-ton shielding door for bringing in large equipment for experiments is at one end. When open, it permits the adjoining closed area to be used as a 100-foot gamma-ray range.

Other facilities located in various parts of the Shipyard include one building entirely devoted to the housing of experimental animals plus one for holding animals and still another for psychological studies; a building for storing isotopes that are issued for individual experimentation; a hot cell with special shielding and waste disposal features for work with radioactive materials at high levels; a building for changing to and from special protective clothing; a beached barge converted to a laboratory for realistically testing effects of radioactive contamination on various materials and surface coatings; a building that houses a 1-Mev X-ray machine; a hollow concrete block used for sample storage; and a portion of one building used for field test sample processing and storage.

Late in 1958 three new projects involving additional facilities were begun. Ground work was laid for use of certain buildings and land areas at Parks Air Force Base, which is being turned over to the Army, for research that will begin in 1959. An animal holding area for large domestic animals was constructed toward the periphery of the Shipyard. In December storage space was transferred from San Bruno to Islais Creek, adjacent to the Shipyard, to save time and transportation costs.

EQUIPMENT

From the "two working Geiger counters and one coffee pot", the pioneers soon developed ways and means to get modern equipment essential for operation of this type of laboratory. In its initial stages the Laboratory actually owned only one alpha counter; everything else was borrowed from the Manhattan District. Rumor said that the borrowed equipment might be "written off," but the Laboratory officers held out for purchase of new, accurate and reliable instruments. A good portion of the first funds appropriated for the Laboratory was earmarked for them, with the requisitions held until the "last minute" to take advantage of latest developments.

Apparatus for the production of radiation had top priority and included: a portable 250 kilovolt X-ray machine for animal irradiation; a 15-curie cobalt source capable of delivering a gamma-ray dose of 1 to 40 roentgens per hour; a kevatron, an electron accelerator designed and built at the Laboratory to simulate conditions resulting from an atomic burst; and a 250 Kev constant potential X-ray machine for use in determining

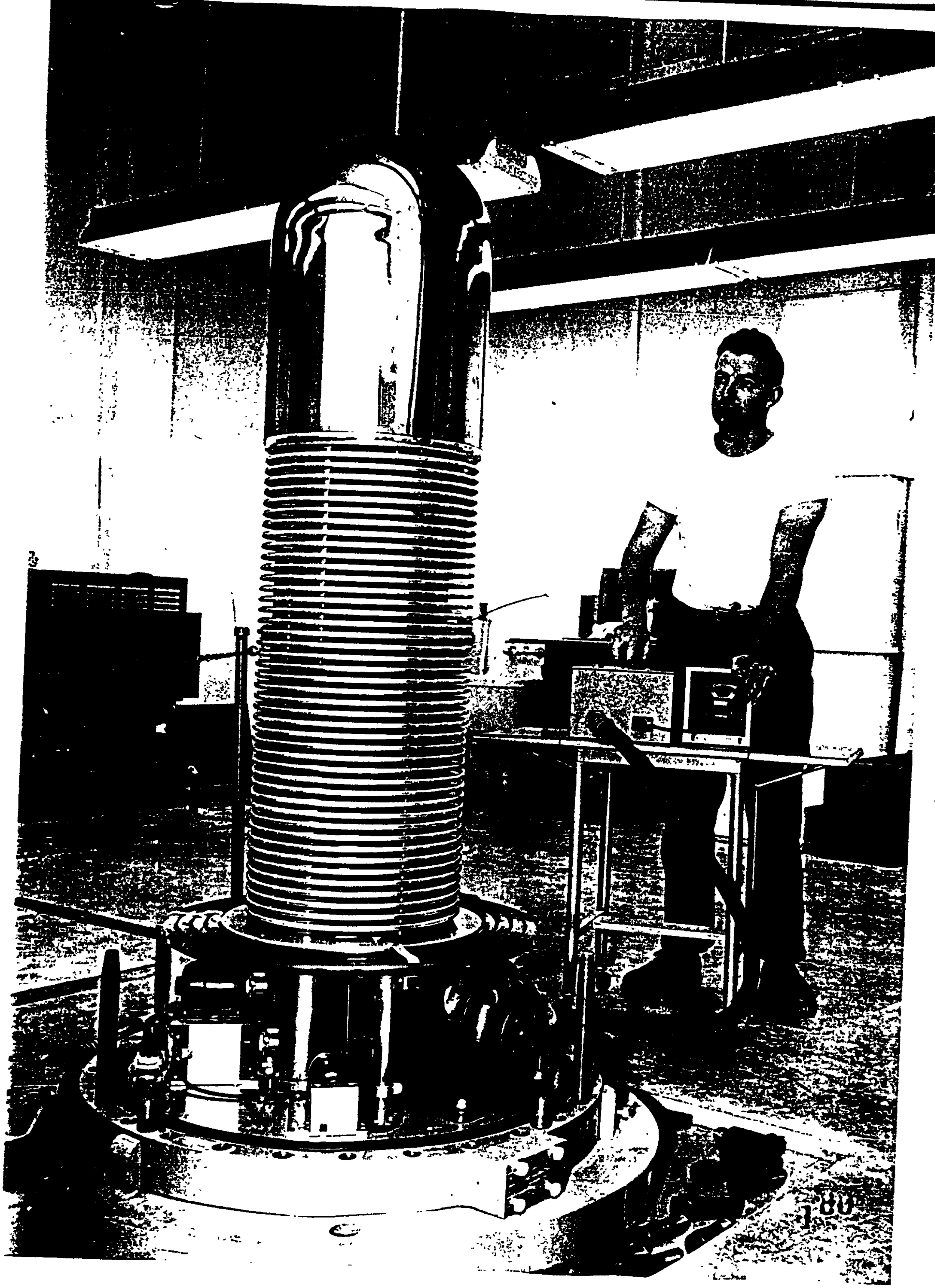
the response of radiation detectors to X-rays of varying energy. In addition to its own equipment, other nuclear irradiation facilities were available to the Laboratory, for example the University of California's Donner Laboratory cyclotron and a 1,000 kilovolt X-ray unit of a local industrial firm.

Other items of equipment added in the first few years as funds permitted were: carbon arc searchlights for production of intense thermal radiation; kymograph and accessories; beta-gamma spectrometer used to obtain information regarding the energies, decay rates and intensities of beta and gamma rays from radioactive materials; high frequency vacuum tube voltmeter, automatic size-frequency particle-size analyzer for measuring size frequencies of dust dispersion collected from atomic bursts; infra-red spectrophotometer; and climatic simulator valuable in the design of electronic equipment which must withstand extreme temperatures, humidity and altitudes. Other items for specialized research were: optical spectrograph for the analysis of radioactive dusts and for determining impurities in radioactive substances; Cary recording spectrophotometers for determining the chemical nature of contaminants; gas absorption apparatus for determining the absolute surface area of materials such as oxides; coincidence counter for calibration and standardization of radioactive sources and of detecting equipment; smoke penetrometer for testing filters; X-ray diffraction unit to determine the compounds present in aerosols resulting from atomic bomb bursts; isotope-ratio mass spectrometer for biological tracer with elements that are either not radioactive or are inconvenient to use with radioactive isotopes; and electron microscope used in measuring particle sizes of finely divided samples from atomic bomb bursts and also for examining tissue sections of various organs. In addition to those described are various other instruments such as electro-cardiographs, ultracentrifuge, electrophoresis apparatus, ultrasonerator, Warburg apparatus, refrigerated centrifuges, etc.

Large Generator Added

The 2 mev Van de Graaff electrostatic accelerator purchased in 1955 gave fresh impetus to the Laboratory's research. Each scientific division has acquired the most modern devices to assist in studies peculiar to its areas of interest and responsibility. These include many types of high intensity gamma radiation sources, different sizes of climatic simulators, multi-channel pulse height analyzers, scintillation spectrometers for use in laboratory or field; semi-trailers for field test use; several radiac calibration ranges; thermal radiation sources plus related equipment; a salt-spray and sunlight simulating cabinet; horizontal and vertical shake tables; additional animal irradiation equipment; electrophoresis-diffusion apparatus; several remote handling devices; various radiological and radiochemical counting devices, and a great deal of miscellaneous equipment to implement the approach to the multitudinous problems of nuclear defense.

The 2 Mev Van de Graaff Accelerator



Ready Supply Store, NRDL's "Super Market"

Glass Blower in Action

In September 1956, a one-million volt X-ray machine was installed for the deep radiation effects program. Less than a year later, approval was received to proceed with the preliminary design of a cyclotron, a high flux neutron source which will require at least two years to construct. Most recent of the equipment is the Datatron electronic computer which was installed in May 1958. A Computing Branch was established to consult with investigators in the design of experiments, problems, programming and coding.

Practical Facilities

Two very useful facilities in the Laboratory are the Glassworking and Precision Instrument Shop where apparatus for scientific experimentation is constructed according to investigators' specifications, produced often from very crude drawings; and the Ready Supply Store which lives up to its name by having supplies on hand to fill every need from the office to hard-to-get chemicals, transistors, and other materials needed by the scientist.

Laboratory Developed Equipment

The Laboratory has long had a major interest in the design, development, and evaluation of radiac instrumentation, not only for its own use but for Navy-wide applications. Among the first developments were the beta-gamma spectrometer and the automatic particle-size analyzer. A practical inexpensive dosimeter for measuring radioactivity brought an award in 1955 to the scientist who tested it for acceptance by the Navy. Some other significant developments have been:

1. The RAS-10 Alpha Survey Radiac. This instrument, utilizing scintillation detection, is intended to fill the Navy's requirements for a field alpha survey radiac capable of extended operation under difficult environmental conditions. The unit is completely transistorized and operates from two standard flashlight cells, it covers a range from 0 to 1,000,000 counts per minute, corresponding to a range of 0 to 10,000 micrograms per square meter of plutonium.

2. The RGG-10 Low Range Survey Meter. The RGG-10 is a low range beta-gamma survey radiac operating from two standard flashlight cells. Printed circuitry is used throughout, and the unit is completely transistorized. It covers the range from 0 to 500 mr/hr in four separate ranges. Beta indication is provided on all ranges with a side window beta capability for personnel monitoring on the two lower ranges.

3. The IM/153 Radiac Dosage Alarm. This unusual unit provides a digital display of integrated dose to a maximum of 1000 roentgens in

steps of 1/10 roentgen per dose rate from 1/10 r/hr to beyond 500 r/hr. The unit is quite small, weighing about 3 pounds. It is a hybrid transistor-tube circuit operating from flashlight cells. A pre-settable audible alarm is provided.

4. The AN/PDR-52 Beta Survey Radiac. This unit, like the one previously discussed, is based on an NRDL developed prototype. This instrument is a multi-purpose device, providing high range beta measurements, beta + gamma measurements and gamma-only measurements. An unusual feature of the unit is its beta-only capability which utilizes gamma cancellation. This feature permits decontamination operations to proceed efficiently in a high general gamma field. The instrument covers the range from 0 to 1000 rep/hr in three separate ranges for each of the above functions.

5. The AN/SDR-1 Shipboard Radiac System. This is a fixed-installation shipboard radiac system covering the range from 0 to 1,000 r/hr full scale in eight decades. The top four decades are transferred to remote readout stations. There is also provision for a pre-set warning alarm on the lower four ranges. Power is ordinarily supplied by the ship's AC lines with provision for 50 hour standby operation from self-contained storage batteries.

6. The AN/PDR-44 High Range Radiac. This instrument, based on an NRDL prototype, covers the standard military high range from 0 to 500 r/hr in three ranges. It is an ionization chamber device operating from one flashlight cell and utilizing an extremely stable dual electrometer tube. A beta capability is also provided.

7. Gamma Intensity Time Recorder Systems. The Model 103 GITR is a self-contained battery operated instrument which records gamma intensity as a function of time upon magnetic tape for unattended periods extending up to 60 hours. It covers the range from 10 mr/hr to 10^5 r/hr in two ranges overlapping at 10 r/hr. A time reference is also recorded on magnetic tape at the rate of 16 pulses per minute on a third channel.

SCIENTIFIC PROGRAM

On 19 November 1946, the day after the Laboratory for Radiological Studies was established, a memorandum announced a "crash" program for: coordination and improvement in the techniques of decontamination; procurement of permanent facilities and equipment; simultaneous creation of positions, writing of job specifications and procurement of technical personnel; clearance to receive necessary reports of the Manhattan District; and provision made for a classified library for their safekeeping.

Engineer shows Laboratory-developed instruments to Japanese military officers


HIGH RANGE
GAMMA
SURVEY METERS
SPECIAL

Problems of the pioneers at NRDL were legion – difficulty of berthing "hot" ships; lack of crane service for removing radioactive materials; rigid shipping regulations; and many others. The handling of arriving radioactive material by the uninitiated required adherence to strict rules to avoid exposure to dockside personnel, and the test materials had to be placed in an isolated, locked portion of a warehouse. A report of the radioactive status of all shipments had to be stapled to the advance bill of lading to warn the consignee. Considering the infinite care and precautions observed, and the fact that all operations were carried out under strict security provisions, the work went forward with astonishing rapidity.

Early in 1947 the immediate studies were defined as centering on development and testing of suitable removal methods and agents; appraisal and standardization of radiation detection instruments; and examination of fissionable materials and their distribution on the ships. Long term studies were concerned with the concentration, scattering, adsorption factors and distribution of fission products on various surfaces and on such materials as steel, plastics, ceramics, cordage, etc; safety training devices; measuring instruments; development of ways to simulate in the laboratory the effects of nuclear attack; development of techniques for handling large quantities of contaminated materials, and of protective coatings.

The Program is Organized

The first recorded specific program was issued in 1948 showing eight master areas of research: (1) Contamination and Decontamination; (2) Handling and disposal of radioactive materials; (3) Theoretical studies and calculations; (4) Dosimetry: (5) Personnel Protection; (6) Biological Studies; (7) Medical Studies; and (8) Instruments, Instrumentation and special apparatus. Each of these included manysubtasks. This program was revised late in 1949 to the following:

(1) Characteristics of Hazardous Radiations and Radioactive materials, including airborne and surface contamination; environment and history of contamination; nuclear and thermal radiation characteristics; measurement of radiation dosage.

(2) Personnel Hazard including lethal and sublethal dose studies – acute and chronic exposure to internal radiation; physiological and anatomical effects of ionizing radiations; biochemical changes following irradiation; maximum permissible dosage; hazard from airborne contamination.

(3) Appraisal of situations and effectiveness of countermeasures, involving the current status and relative importance of countermeasures and analysis of operational feasibility of decontamination.

(4) Radiac instruments, mechanisms of radiation detection; individual and group warning and alarm instruments; instrument test devices; analytical instrumentation; and evaluation of equipment.

(5) Protective measures, including coatings; properties of new materials and methods; anti-contamination protective devices; individual and collective protection of personnel.

(6) Reclamation measures, including physical and chemical methods, specifications and standards for equipment, personnel and procedures; handling and disposal of contaminated residues (waste); reclamation of bulk materials.

(7) Medical diagnosis and treatment, consisting of prophylactic and therapeutic studies; complications and complicating factors in radiation injury.

(8) General projects covering preparation of manuals and information surveys; planning and preparation for future Nuclear Weapons tests; design of scientific equipment and facilities.

Not actually a part of the scientific program, but in support of it were services provided by groups such as Health Physics, Medical Services, Auxiliary services and Technical Information.

Scope of Program Widens

Through the years the scientific program has continued along similar lines, broadened to carry on both basic and applied research in the various problems inherent in the field of atomic defense. Starting in 1958, the Laboratory progressed to long range planning of its research. The proposed Technical Program for FY 59 was presented in a format that not only gave detailed proposals for that year, but also showed a charted path of research for a five year period into the future. The philosophy underlying this approach is a three-fold one:

(1) As the nation's expert in the field, the Laboratory deems it a moral and inherent responsibility to maintain a continuing review of the state of knowledge in the areas of its mission, and, as a corollary, to highlight the areas of ignorance ahead as it sees them.

(2) Similarly, the Laboratory deems it a responsibility to coalesce the demands of its many sponsors and the thoughts of its own scientists into a coherent technical entity, a program designed to probe into those areas of ignorance. Budget limitations, availability of personnel, "crash" programs, the inability always to match competence and facilities with need – all combine to preclude the program of any one year from being a perfect technical entity. Nevertheless, an attack on a long range scale is

feasible and can be accomplished through planning. The area that cannot be explored this year can, through planning, be explored the next – or the next.

(3) As a by-product of this long range planning, it is hoped that a portrayal of an orderly and planned research attack might well help crystallize the thinking and planning of the Laboratory sponsors. The presentation of the over-all picture is more than can be implemented in any one year, but from that picture the sponsors, knowing their most immediate needs can then give support to those phases they consider the most urgent at that time.

So far the results of this plan have been encouraging. The scientist can see where he is going. The sponsor can see what part his program plays in the whole attack on the problems of radiological defense and can view the attack in phases rather than in yearly increments which usually are staccato and somewhat uncoordinated. Finally, Laboratory management can plan its programs on a continuing basis with better assurance of timely funding, the lack of which is one of the hazards of government supported research.

Current Program

In its growth and development the seven broad phases of the scientific program now cover:

(1) Determination of the characteristics of harmful radiations and radioactive materials.

(2) Study of atomic explosion phenomenology and weapons effects.

(3) Study of hazards of nuclear radiations to personnel.

(4) Development of instruments to detect, identify and measure radioactivity.

(5) Development of countermeasures for removing radioactive contamination and for minimizing or preventing contamination.

(6) Study of measures to minimize harmful effects of nuclear radiation on human beings.

(7) Study of physical and biological effects of thermal radiations accompanying nuclear weapons detonations.

Charged with carrying out these studies are the four scientific divisions.

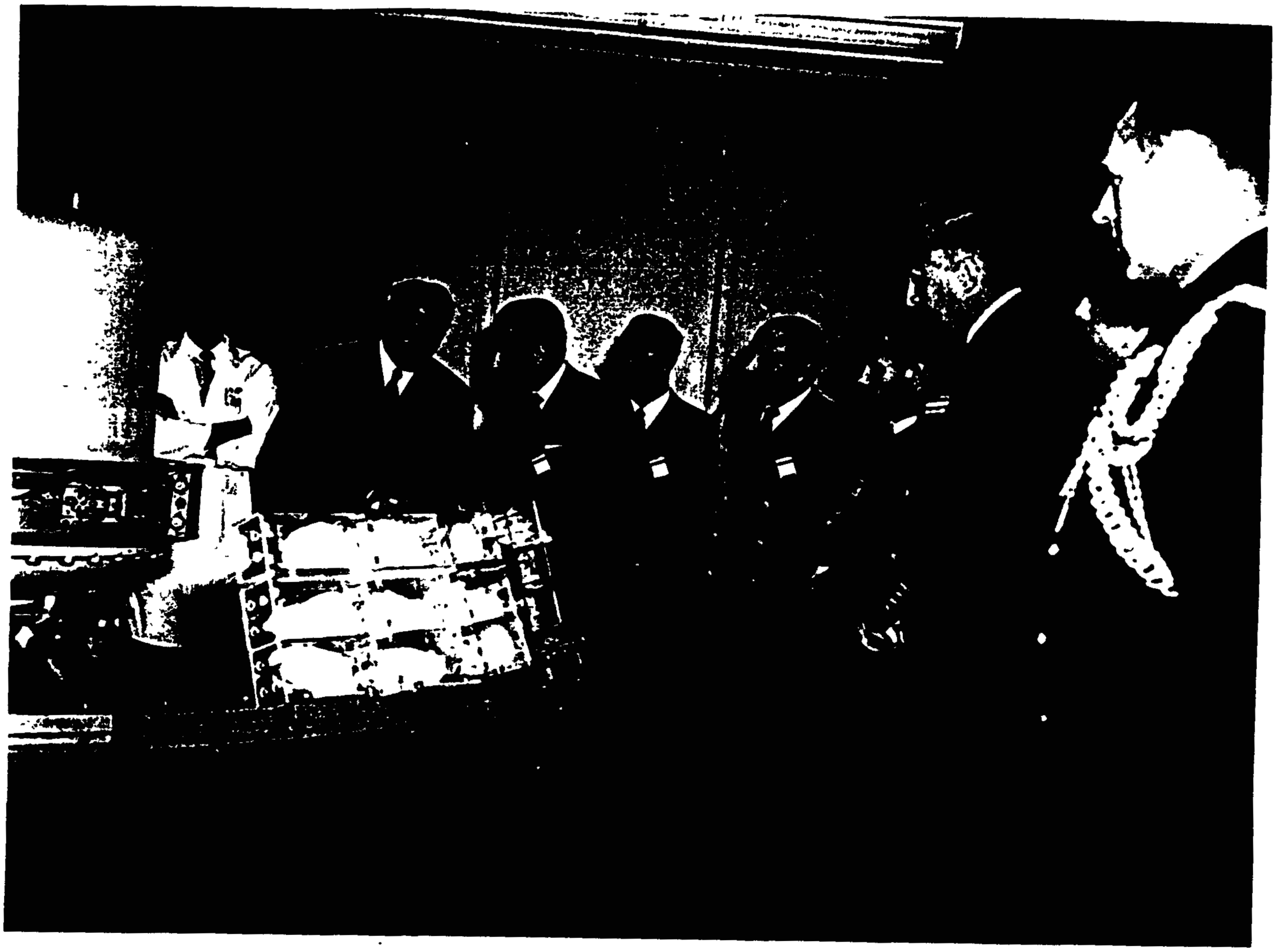
Biological and Medical Sciences. This division is involved with problems of injury to personnel resulting from nuclear and thermal radiation. From the earliest days of the Laboratory, biologists and doctors of medicine have been studying the complex relationships between radiation and the organism. Experimental animals, mostly rats and mice, have been used in a great variety of basic studies, most of which are too esoteric for discussion here. The general aim of this work, however, is to learn the nature of radiation injury, how to prevent it, and how to treat it, ultimately in the human.

Early difficulties and disappointments with animal studies at Operation GREENHOUSE and BUSTER/JANGLE led to the development of laboratory radiation sources for greater economy, efficiency, and control of experimental variables. These sources include many emitters of nuclear radiation as well as two particularly satisfactory thermal sources – the Mitchell carbon arc, whose energy is usually emitted in the form of a standardized simulation of a nuclear weapon's thermal pulse; and the 30-inch searchlight, whose energy, about three times that of the Mitchell, is normally controlled by a precise square-wave shutter on which staff members hold a patent.

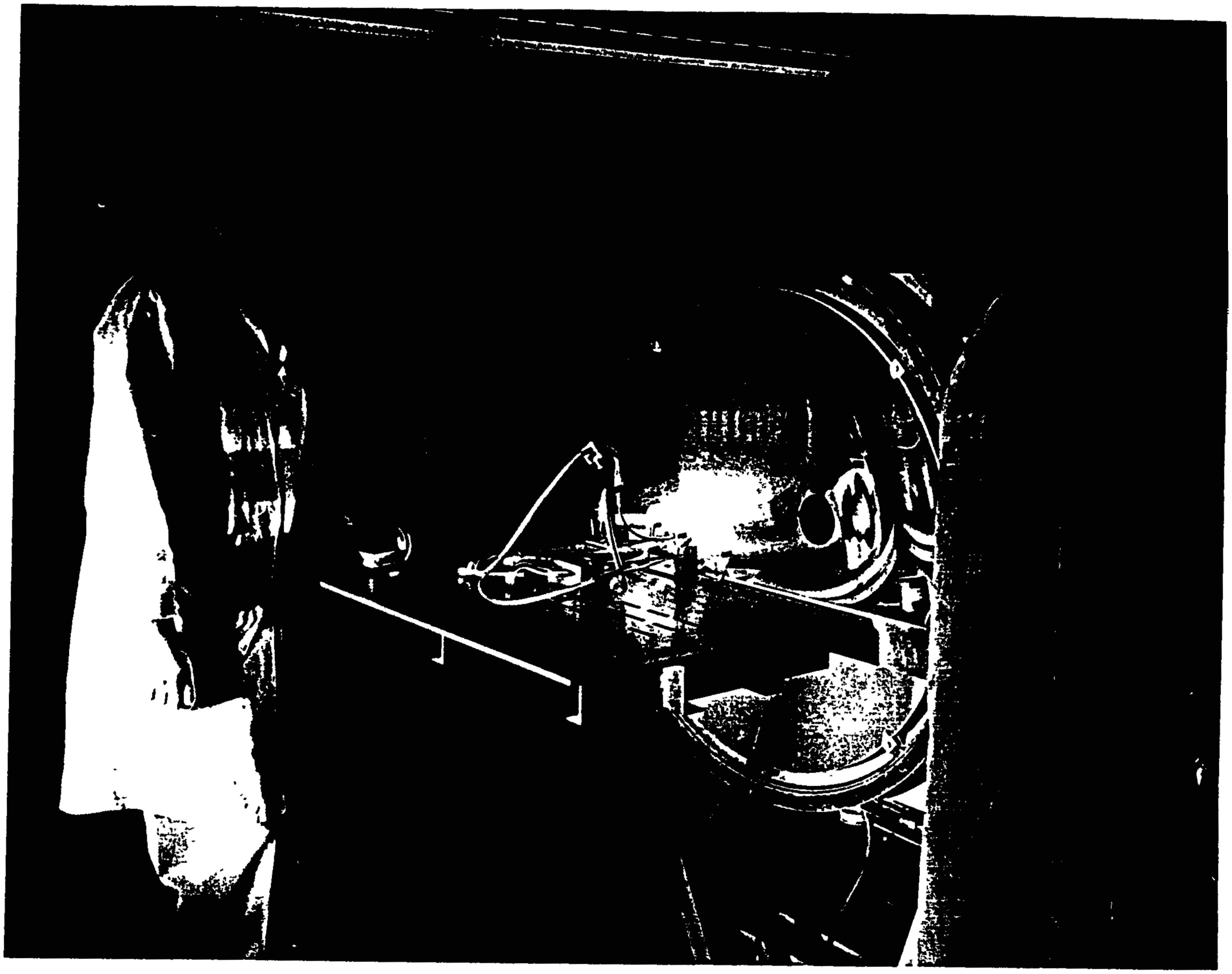
Studies of rat skin burns developed into investigation of more profound systemic effects such as erythrocytic fragility and led to the first Thermal Burn Conference, held at NRDL in 1953. They also were expanded to include burns from beta particles from P^{32}, a Sr-Y plaque (with a longer half-life than P^{32}) which produces about 25 rads/sec, and electrons from the Van de Graaff accelerated over a wide energy range – from the machine's upper limit of 2 Mev down to levels at which the electrons will penetrate skin only to a depth of 100 microns. Volunteers have exposed themselves to first degree thermal burns and, with the required approval of the Secretary of the Navy, to low-level beta radiation, attempting to add to the small store of data on the human. At present, long-term inter-species comparisons using large mammals are under way, particularly with neutrons, again in an attempt to extrapolate, eventually, to the human. In vitro studies of the inhibition synthesis of DNA (a basic cell material) by sodium ions, which as among the products of ionizing radiation, are of interest to the cancer researcher. Studies of avoidance conditioning, wherein animals will quickly learn to avoid a place where they were given low doses of x- or gamma radiation, raise interesting questions about their sensing the presence of radiation. Other work has shown that the liver, thought to be insensitive to radiation damage, shows a high percentage of mitotic anomalies when cell division is accelerated. Successful inter-species transplants of skin and bone marrow are provocative to those studying radiation therapy.

Nucleonics. This division makes investigations associated with nuclear reactions including studies of their characteristics and behavior; and evaluation, design and fabrication of radiac instruments. Working closely with the biologists, the physicists have developed sources and instruments to detect and measure the thermal and nuclear radiations.

BIO-MED — The Radiological Medical Director explains a radiation source demonstration to distinguished visitors from South America



NUCLEONICS — Demonstration of the 36-inch high intensity carbon arc thermal source



They have also carried out a continuing program of studies, characterizing and defining the various energy forms released by nuclear detonations and their effects on physical materials. A long series of thermal observations at nuclear weapons tests in Nevada and the Pacific are currently being summarized for publication.

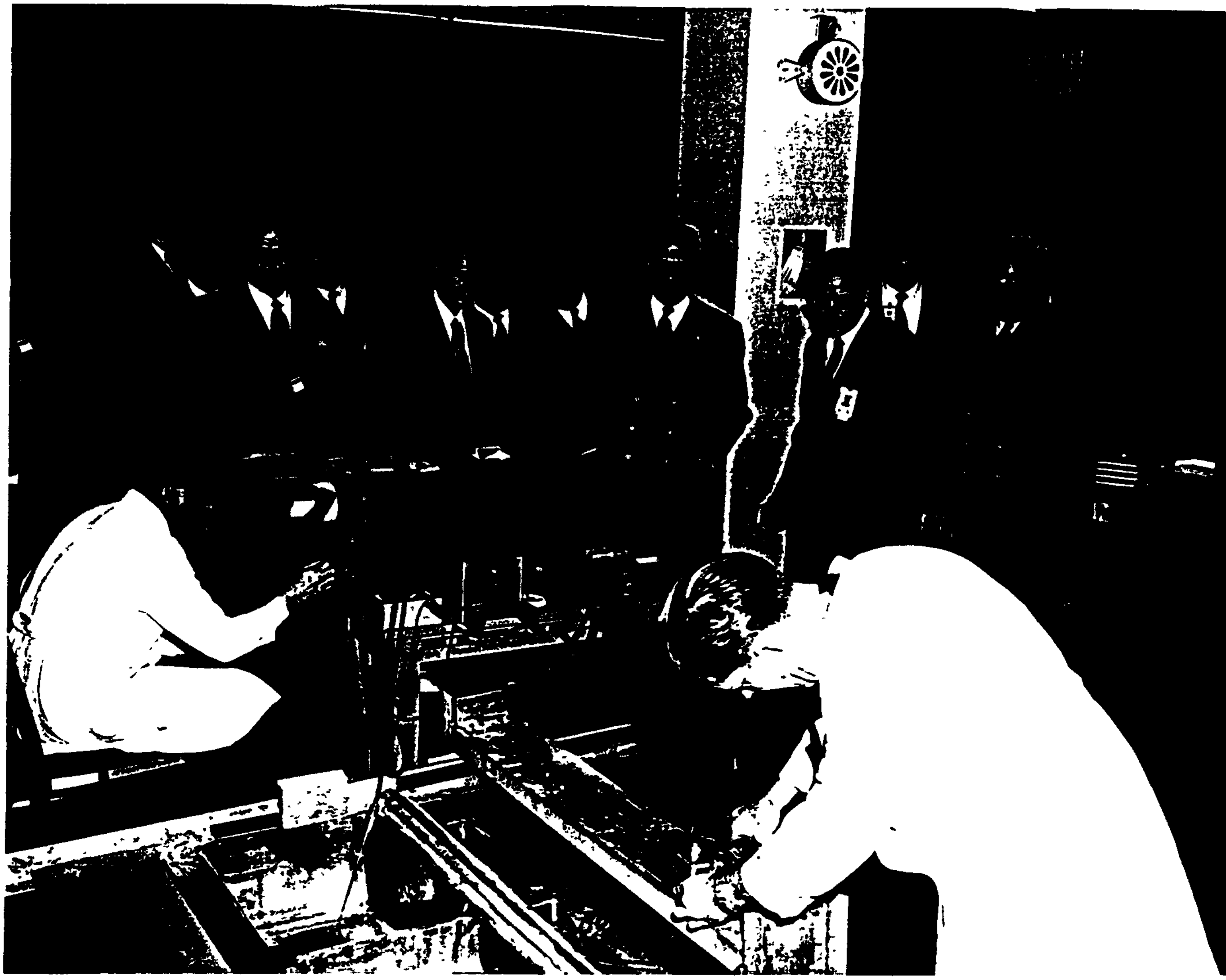
The physical characteristics of thermal radiation have been adequately defined for all yields at the lower altitudes for operational purposes, i.e., damage effects can be confidently predicted. Current studies emphasize environmental variables such as atmospheric attenuation and scattering by clouds. Basic studies of ignition phenomena, using controlled thermal sources and a standard fuel developed by Forest Products Laboratory, have been made. Other studies of high-temperature effects on materials are related to missil development problems.

A long series of studies on gamma penetration through steels has led to experiments carried out on an aircraft carrier and a destroyer to verify, extend, and correlate with the laboratory and theoretical studies. Another continuing program has studied nuclear radiation damage to dielectric materials in an attempt to find better insulating materials for use in the high radiation fluxes around reactors.

Chemical Technology. This division develops practical methods, equipment and procedures for decontamination and for minimizing contamination. It has developed and applied many new analytical techniques and methods for more rapid determination of fallout constituents. Sequential ion exchange permits analysis of a single sample for many elements instead of having to use a separate aliquot for each element. Polarographic separation techniques developed here permit the very rapid radiochemical determination of many radionuclides from fission product mixtures. In the process of separating rare-earth fission products, several previously unknown fission products were discovered in the right wing of the fission yield curve. Many physical and chemical reactions occurring in the actual fireball have been described, as have very early-time decay processes. Standard analytical instruments have been modified and applied to the determination of the nuclide mixtures in fallout. The Laboratory published, first in 1949, with a revision in 1956, the definitive work on theoretical growth and decay for each fission product chain of interest.

Military Evaluations. This division conducts research on the evaluation and interpretation of scientific information in terms of military problems and needs. There is often a gap between specific technical findings and their applications to operational problems. The Laboratory has become increasingly involved in operations analysis, wherein detailed laboratory and field experiments are collated and recommendations made to sponsoring agencies toward solutions of their applied problems. Some of the major studies of this type have reported on base evasion maneuvers; gamma radiation hazard to submarines near a deep under water burst; personnel radiation hazard to air crews exposed to the

CHEM-TECH — The Commander-in-Chief, Atlantic Fleet, Admiral Jerauld Wright, and members of his Staff hear a description of the transport of contaminant by water films



MILITARY EVALUATIONS — The Model Shelter designed at NRDL
Mayor of Salt Lake City and Scientific Director

atomic cloud; passive defense and principles of damage control in atomic attack on shore establishments; scaling of contamination patterns; development of mathematical models of fallout; naval supplies under atomic attack; radiological defense measures as a countermeasures system; countermeasure performance requirements for carrier air operations after a shallow underwater burst; thermal vulnerability of fixed military installations; radiation fields in military structures; tactical requirements for dose and dose-rate information on ships; prediction of casualties from land surface nuclear detonations; radiological implications in the use of atomic weapons as a mine countermeasure during amphibious operations; performance specifications for a sound national shelter system; recovery of Army terminal operations after nuclear attack; radiological recovery of advanced bases; escape problems of ships delivering nuclear weapons; wind measuring systems for tactical fallout prediction; radiological effects of nuclear tunnel demolition; and umpiring criteria for nuclear war games.

FIELD OPERATIONS

The Laboratory has participated in every major U.S. nuclear weapons test in the Nevada and Eniwetok Proving Grounds since 1950. These include Operations GREENHOUSE (1951); IVY (1952); CASTLE (1954); WIGWAM (1955); REDWING (1956); and HARDTACK (1958) in the Pacific.

Nevada tests were: RANGER (1951 - observation only); BUSTER/JANGLE (1951); TUMBLER/SNAPPER (1952); UPSHOT/KNOTHOLE (1953); TEAPOT (1955); and PLUMBBOB (1957).

The principal interest of the Laboratory has lain in the effects of the weapons. What modification in doctrine and tactics would be necessary as a result of the introduction of the nuclear weapon into the fleet? What defensive measures must be instituted? To make a start on the answer to these questions, NRDL moved an entire shipload of research investigators, scientific equipment, and experimental animals to Eniwetok Atoll in 1950, a year prior to Operation GREENHOUSE. Animals must become acclimated to a new environment before they can be used in experiments since frequently the effects of the new environment cannot be differentiated from those resulting from the experiments (in this case, exposure to the radiations of the weapons). When the GREENHOUSE weapons were detonated, these animals were exposed to the nuclear radiations under a variety of conditions and the physiological changes which occurred were observed and documented. From this work the Laboratory hoped to be able to predict what the effect of these radiations would be on the crews of ships and on the personnel of shore installations in the event of nuclear attack.

Another project of the GREENHOUSE Operation studied the radioactivity in the atomic cloud. Drone aircraft were flown into the cloud to obtain samples of the particulate matter which would later become fallout. The chemical composition and the rate of radioactive decay of these particles were studied as was the distribution of radioactivity with particle size in order that predictions would be made as to the size, shape and duration of the fallout pattern.

In another project, removal of radioactivity from the aircraft flown through the cloud was studied in order to develop the best methods for quickly returning an aircraft to duty.

One project studied the thermal qualities of the fireball in order to determine its ability to ignite flammable materials and to produce burn casualties. Subsequent to this early work the thermal effect became even more important with the development of the "hydrogen" weapon.

The first "hydrogen" device was detonated at Operation IVY. Here the Laboratory's efforts were directed to attempts to obtain fallout samples and thermal data. The scope of the effort was limited; however, enough evidence was obtained to make the prediction that the fallout from megaton range weapons would be a major consideration in future detonations.

In Operation CASTLE the main effort was again in the fallout area. Two Liberty ships were outfitted with collection instruments and radio control. They were sent unmanned into the fallout field. One ship was unprotected, the other equipped with a seawater spray system intended to wash fallout off the ship as it fell. This "washdown system" proved highly effective and has since been installed throughout the Fleet. Free floating fallout collectors, each with a radio homing beacon to assist in retrieval, were placed in the open ocean in an attempt to define the primary fallout areas.

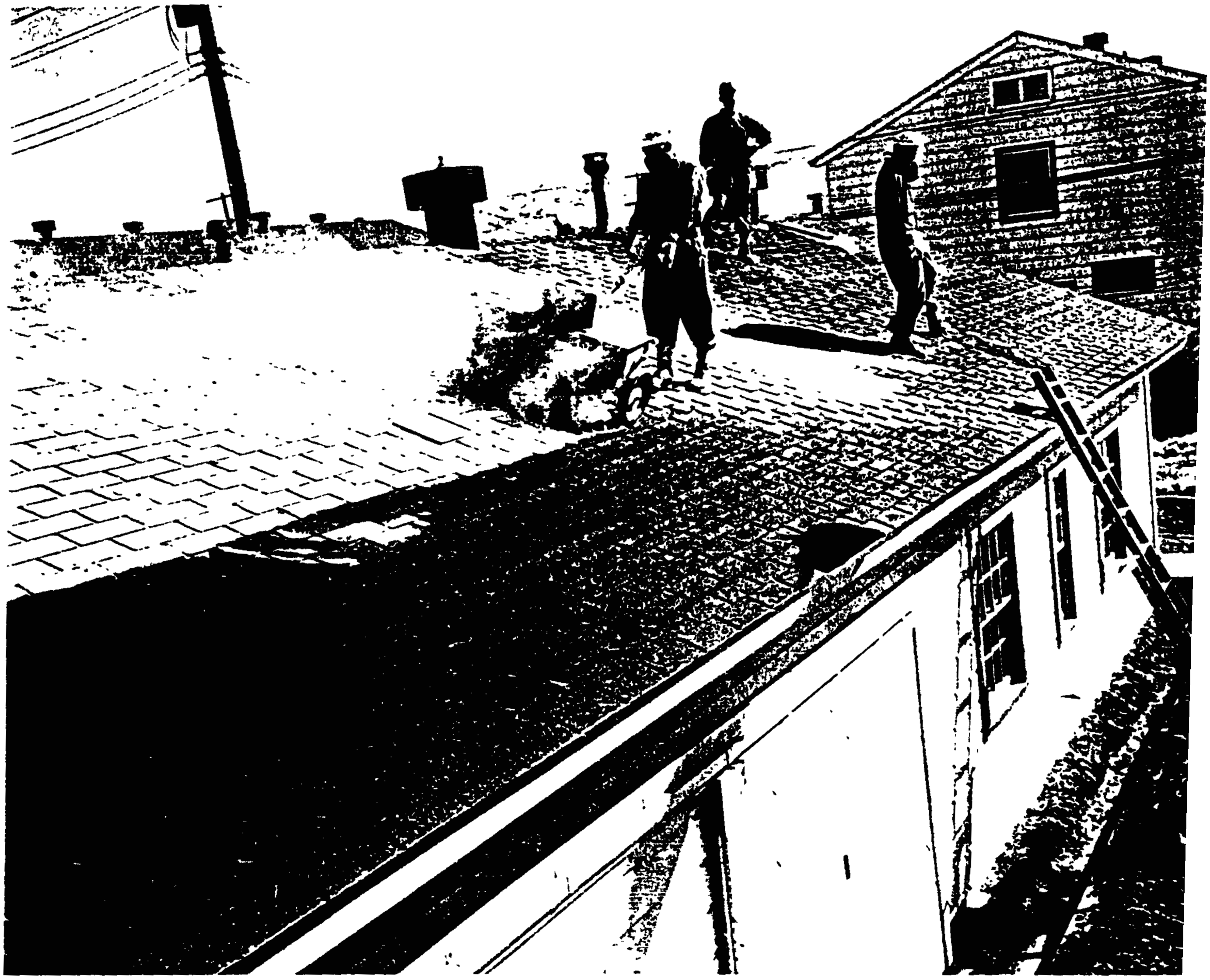
As one indication of the magnitude of the contribution of this Laboratory to these three operations, a total of $2,611, 650 was provided to support NRDL projects.

Operations REDWING and HARDTACK continued and expanded the projects begun on the previous operations. At Operation HARDTACK several tactical weapons were detonated under various conditions of burst. Damage to ships from both surface and subsurface detonations was investigated at a number of distances from ground zero. Standoff distances from ASW weapon delivery were determined in order to assist the Fleet in developing tactical doctrine for the use of these weapons. Fallout collection stations were moored in the open ocean as well as the lagoons of the atolls. Radio-chemical analysis of fallout was refined as were methods of removing it. Differences between the effects of deep underwater, shallow underwater, surface, and air bursts were studied to help prepare this country to defend itself against whatever manner and whatever

FIELD OPERATIONS — Operation IVY — Shot "Mike"

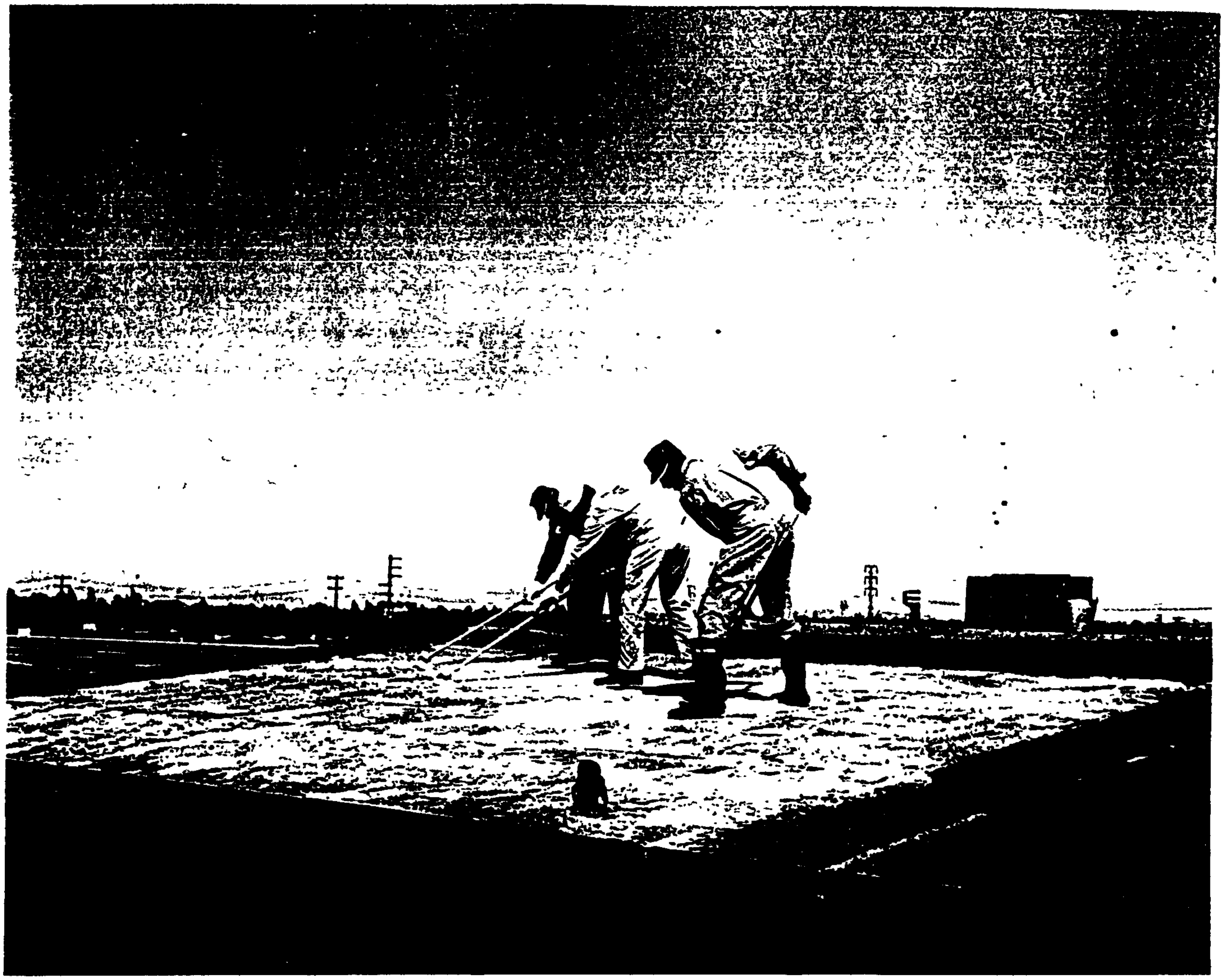
FIELD OPERATION

Land Target Studies at Camp Stoneman — Dispersal of radioactive simulant



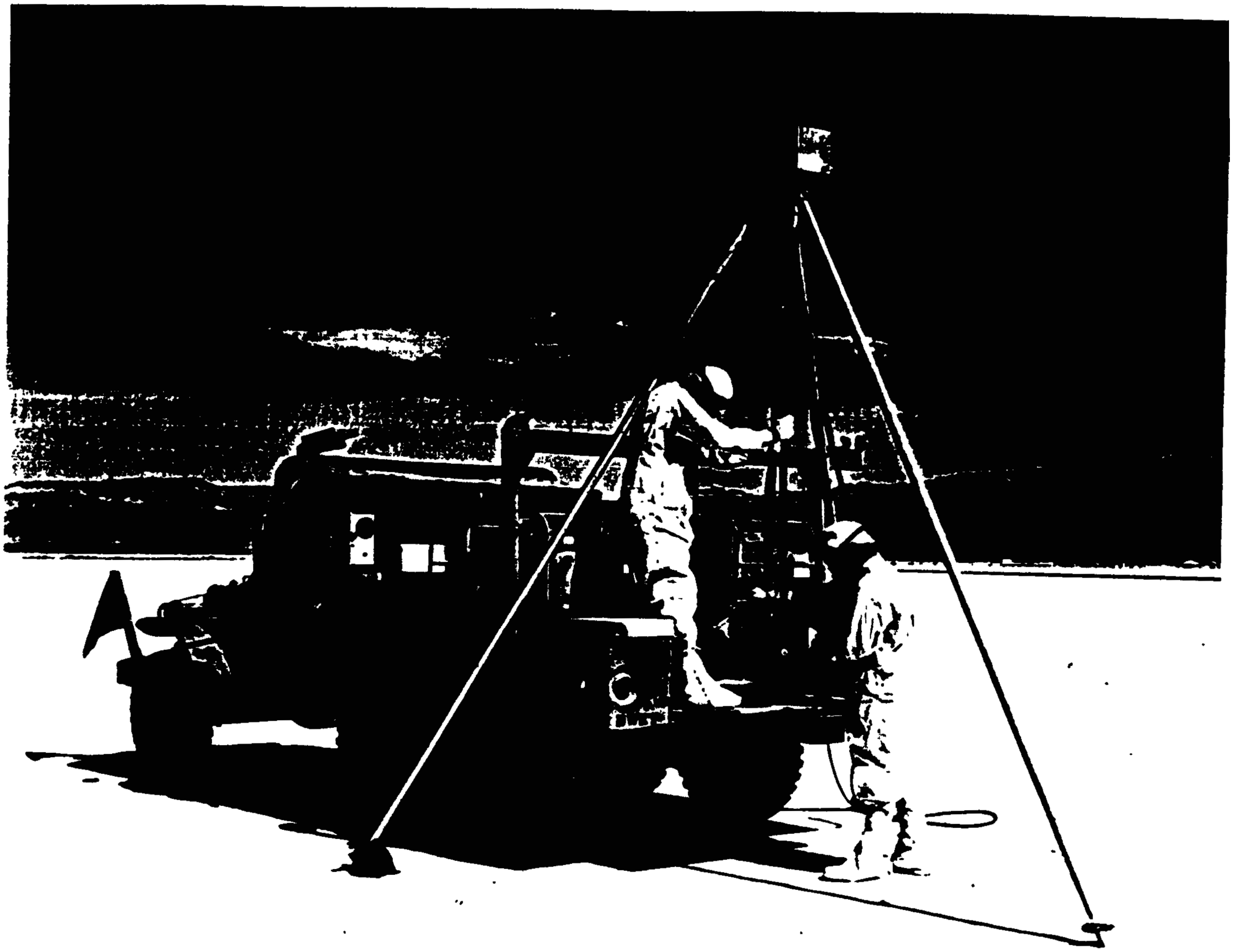
FIELD OPERATION

Land Target Studies at Camp Stoneman — One method of Decontamination

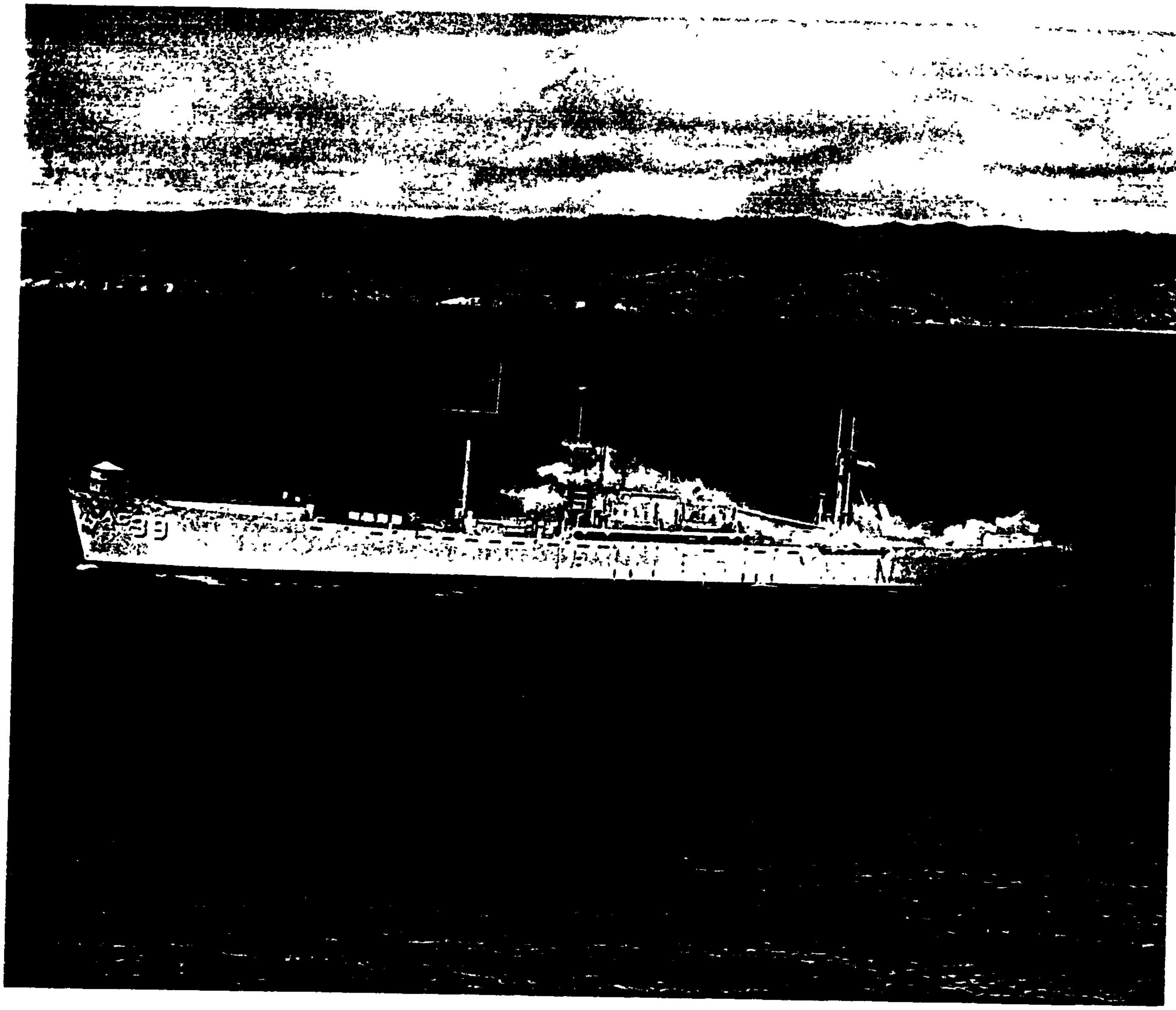


FIELD OPERATION

Mobile Research Laboratory used for nuclear spectroscopy research away from NRDL



Washdown in operation on ship used in field tests



yield nuclear weapon might be delivered against us. Each of these field studies has also provided a wealth of samples for laboratory studies to characterize and define the variables in the fallout material itself.

In addition to concentration on tests of nuclear weapons, the Laboratory has had a continuing program using high explosives as models for bombs. This included the High Explosive Model (HEM) Series which began about 1953 and was supplanted in July 1958 by the HYDRA Series, devoted entirely to underwater bursts. This is a long range program consisting of five phases to extend over the next five years.

REPORTS

The end result of scientific research is the report on the findings. The importance of this was realized by the Laboratory's founders who in March 1948 issued instructions on the preparation of technical reports. At that time three types of reports were scheduled:

(1) Progress Reports, issued monthly, giving thumbnail sketches of the work in progress and concise statements of essential results.

(2) Interim Reports, which were summaries of several months of progress reports.

(3) Summary Reports, issued when particular lines of investigation were completed.

Report categories were also established, designated as the AD Report (Atomic Defense), so called because of the type of research conducted, with a third letter to place each report in the correct category (for example ADA – abstracts, lists, etc. ADB – biology, biochemistry, etc).

In 1952 the AD prefix was replaced with USNRDL-TR (Technical Report) because another Government agency was using AD as a report designation. Report #338 was AD and #339 was USNRDL-TR. During the ensuing years several different types of reports have been added, though a series known as the United States Naval Radiological Defense Laboratory Report is still used for the more formal and comprehensive reports. Other categories of technical publications are: Manuals; Technical Memoranda, which include both informal and formal notes on work, the results of which have not undergone complete review or received Laboratory endorsement in the same sense as a Technical Report; Progress Reports, issued quarterly on all Laboratory programs including current status; Instrument Evaluation Reports, which cover evaluation of instruments sent to the Laboratory by Government installations

or industry; Evaluation Reports, which evaluate products or materials; and Review and Lecture Reports, which are either literature searches or lectures given by Laboratory members at meetings.

Apart from these Laboratory publications are those technical reports written on the results of Laboratory participation in weapons tests conducted at Eniwetok or in Nevada by the Department of Defense - Atomic Energy Commission. Each field operation is composed of several projects, each of which is recorded in a report. There are three stages for every report:

(1) Pre-test Report describing the data sought.

(2) Interim Report (ITR), a preliminary report written at the test site, indicating the data received from the test.

(3) Draft of the final Weapon-Test Report (WT) which is written after the data have been analyzed and interpreted. The Weapons Test Reports are actually published by the Armed Forces Special Weapons Project.

Total reports issued by the Laboratory by types are:

U.S. Naval Radiological Defense Laboratory Reports	-----	121
Atomic Defense Reports (AD)	-----	338
Manuals (Drafts)	-----	7
Technical Reports (USNRDL-TR)	-----	287
Technical Memoranda (TM)	-----	98
Progress Reports (P)	-----	17
Instrument Evaluation Reports	-----	42
Evaluation Reports	-----	7
Review and Lecture (RandL)	-----	72
Weapon-Test Reports (WT)	-----	74

Following are descriptions of some of the larger technical publications. One of the early significant formal contributions by the Laboratory was the summary of the state of knowledge at that time prepared in 1949 for the 1950 edition of "Effects of Atomic Weapons". About the same time, material was prepared which formed the basis for Volume II of "Radiological Defense", published by the Armed Forces Special Weapons Project in 1951. This early work was applicable only to liquid contamination. In 1951 studies of the reclamation of land targets were begun with

aircraft-collected samples during Operation GREENHOUSE. The data obtained are unimportant today, but the effort represented the first real break with the tradition of liquid contamination and also involved the first attempt to simulate a dry fallout for experimental purposes. The underground shot at Operation JANGLE produced a heavy, visible deposit of fallout and permitted a clear distinction between liquid and dry fallout. It became clear that decontamination of dry fallout would reduce radiation levels by at least a factor of 10. These JANGLE experiments are still the only full-scale reclamation studies conducted at a field test, although the Laboratory has since (in 1956 and 1958) carried out large-scale engineering studies of land target reclamation at other locations, particularly at Camp Stoneman. These studies included the development of an effective fallout simulant which affords the opportunity for valid experiments in a continuing program of land target reclamation investigations at nearby locations. The state of knowledge at the time was represented by "Radiological Recovery of Fixed Military Installations", a joint-service manual prepared by NRDL during 1952 and 1953 and issued by the three services in August 1953.

During Operation CASTLE in early 1954, the accidental injury of people a hundred miles from Shot Bravo ground zero gave a new dimension to the fallout problem, and the tremendous area of hazard made a profound impression.

Megaton-yield weapons gave radiological defense a priority status, but tests in the coral atolls of the Pacific produced a typical fallout. This fact led to the development of fallout simulants and to continually-refined theories of decontamination such as "Theory of Decontamination, Part I", which emphasizes removal of material mass rather than radioactivity.

The most recent reclamation information is summarized in the April 1958 revision of "Radiological Recovery of Fixed Military Installations" (Army TM 3-225; Navy Bureau of Yards and Docks TP-PL-13). Little remains of the 1953 version. It is shown that in some instances, dose may be reduced by a factor of 100; recovery planning is reduced to a definitive step-by-step process.

PUBLICATION IN THE OPEN LITERATURE

Hand in hand with the issuing of reports on scientific investigations go the journal articles which are largely responsible for building the reputation of the individual scientist as well as his organization. Laboratory investigators have had approximately 1,000 of these printed in such major scientific journals as Analytical Chemistry, American Journal of Physiology, Blood, Cancer Research, Journal of Applied Physics, Nucleonics, Journal of Colloid Science, Physical Review, Journal of the American

Chemical Society,Meteorology, Federation Proceedings, Plant Physiology, Optical Society of America, Journal of Immunology, Radiation Research, Review of Scientific Instruments, Science, and a host of others. Many unclassified reports that do not appear in the scientific literature are reprinted by the Office of Technical Services, Department of Commerce, for sale to the general public.

PATENTS

Somewhat akin to the report is the patent, the outcome of experimentation and development. The first patent resulting from Laboratory research was issued in June 1951. Entitled "Method and Apparatus for Measuring Resistance of Blood During Clotting," it relates to the measurement of electrical resistance of fluids, more especially blood during clotting and clot retraction.

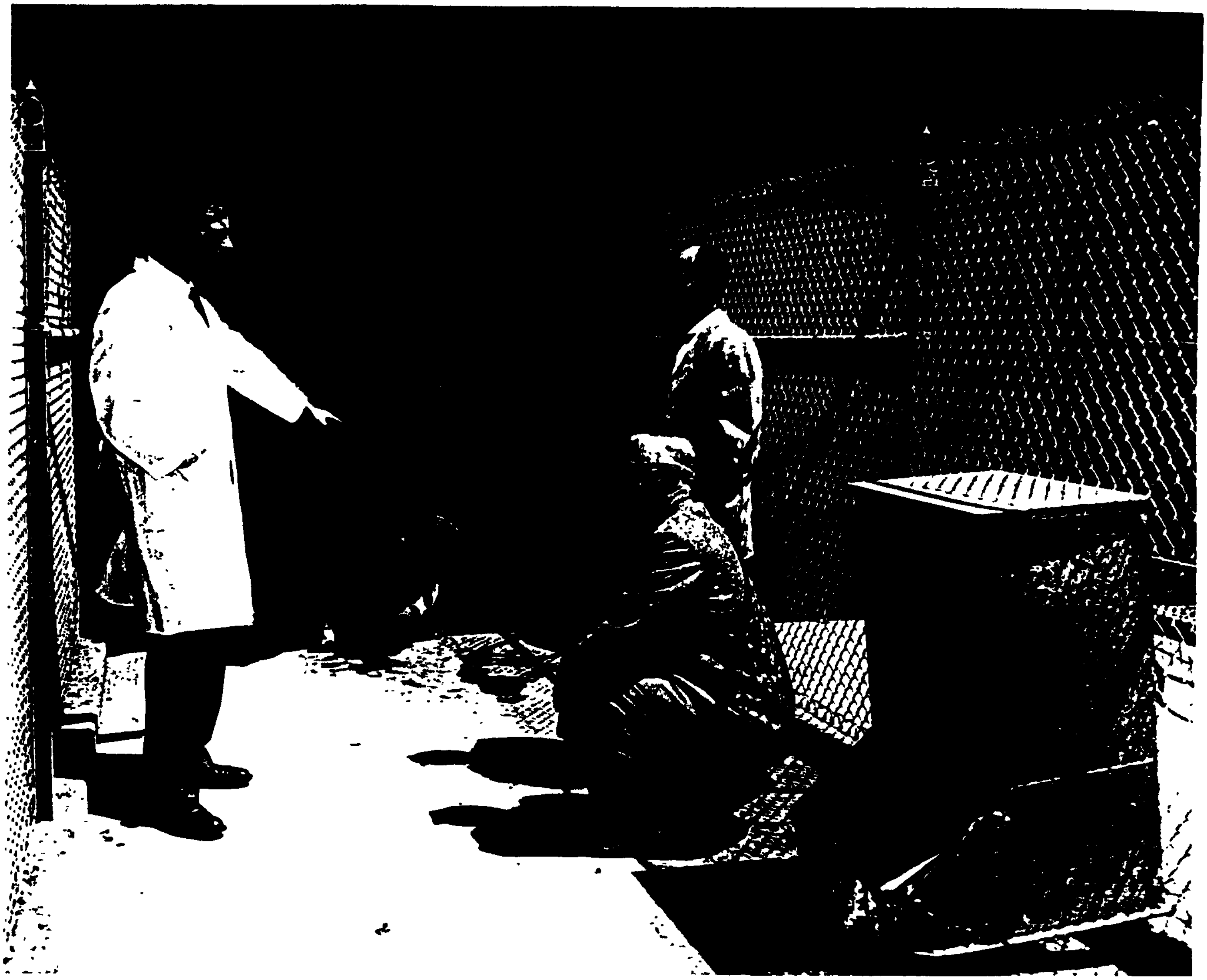
In mid-1954 the patent program of the Laboratory was broadened with emphasis placed upon submission of applications for patents on developments made. As part of the intensified program, lectures were given by patent counsels with follow-up visits to the Laboratory divisions from which more patents might be expected. One of the scientists was appointed as Patent Liaison Officer, with the responsibility for organizing and implementing the program. Because NRDL has a potential for increased patent research, a full-time Bureau of Ships Patent Adviser was assigned an office in the Laboratory in June 1956, working out of the district Patent Counsel Office in Mare Island. He was transferred to San Diego a year later, leaving the duties to be performed by the Patent Liaison Officer.

Since the first patent was issued, approximately 160 patent disclosures have been submitted with 17 searches completed and patents issued.

ASSISTANCE IN EMERGENCIES

The Laboratory's knowledge has proved invaluable in a few cases of atomic accidents. The first was in January 1950 after a glass capsule containing 40.3 mg of radium sulfate was spilled in a classroom on Treasure Island. Widespread contamination of the building and personnel was found, and the crew from the Laboratory immediately set to work to control the contamination of the students' clothing and then of the building.

Susie the Sow, and companions, brought from the Marshall Islands following exposure to radioactive fallout, afforded an excellent opportunity for studying the uptake of Strontium-90 on growing bone. When they left home these pigs weighed 15 to 25 pounds. In a year their weight was 150 to 200 pounds.



The success of the undertaking brought recognition of "invaluable technical aid rendered at the onset of the casualty."

Four years later the Laboratory helped repair the damage caused by the rupture of several uranium fuel elements at Canada's Chalk River Atomic Energy Project. The experience gained was of inestimable value in devising safety measures for future use. Two members of the Laboratory were in charge of planning the operations, with sixteen others assisting in the operation.

Also in 1954 an unfortunate consequence of one of the Operation CASTLE detonations was the contamination of several inhabited atolls of the Marshall group, necessitating evacuation of the populations. A team of medical doctors and corpsmen from NRDL and other laboratories was immediately organized and sent to Kwajalein to care for the Marshallese. This was the first opportunity for fully equipped medical scientists to treat and observe people exposed to radioactive fallout. Much valuable information was obtained and, as a result of the care provided, no casualties resulted. Yearly examinations of those exposed were made. No long-term symptoms due to the exposure have been observed.

In addition to the medical examinations, a team of radiochemists from this Laboratory has surveyed the islands making analyses of the flora and fauna to determine when the populace could be returned to their homes.

PLUCON Team Formed

As a result of a directive from the Chief of Naval Operations, NRDL has established one of the two teams held in readiness for emergencies involving radioactive materials. This Plutonium Control (PLUCON) team was activated in January 1958 and is maintained continuously on the alert with all necessary instruments and equipment to answer any call within four hours alert notification. Members are drawn from both military and civilian personnel. Functions the team is capable of providing are:

(1) Provide over-all advice on optimum methods of handling organizational and operational problems associated with decontamination, and control of large areas.

(2) Provide an instrument standardization service and advice on the interpretation of data derived from monitoring and instrument readings.

(3) Provide certification of hazardous and safe areas based on established maximum permissible levels of surface and airborne plutonium contamination.

(4) Provide advice regarding available and desirable methods of decontamination, reclamation, and waste disposal.

(5) Provide information regarding logistic and equipment requirements, anticipated effectiveness, and cost of recovery in terms of time, manpower, and money.

(6) Provide advice and assistance in evaluating the extent of the biological hazard incurred by personnel exposed prior to evacuation and the control and evaluation of the biological hazard suffered by recovery and reclamation crews during the decontamination operation.

Another team formed for emergency action is the Radiation Sickness Team which is composed of Laboratory medical doctors and hospital corpsmen.

In April 1957 NRDL provided a member for a group that toured the east to assess the radiological safety of governmental relocations to be used in case of emergency. Their findings will be included in a manual for use as a guide for architects and engineers in evaluation of many other relocation sites.

CONGRESSIONAL HEARINGS

In May 1956 the first Congressional hearings held by the Military Operations SubCommittee of the House Committee on Government Operations into the state of civil defense preparedness were held in Los Angeles, with the Commanding Officer and Director, the Scientific Director and Head of Military Evaluations Group giving testimony. They described the three principal stages of the passive defense problem, mentioning various countermeasures with emphasis on the Laboratory's studies on shelters as the primary key to survival. This testimony was later described by participants as among the most valuable received, and as analyses upon which the Committee leaned heavily.

Testimony was again given by these Laboratory officials in 1957 before the same Committee in Washington regarding the feasibility of providing a nation-wide underground nuclear attack shelter system. Composed mainly of facts stemming from NRDL studies of fallout, it described details of the problems to be tackled and the cost of solving them. Further hearings are planned for 1959.

TRAINING OF LABORATORY FORCE

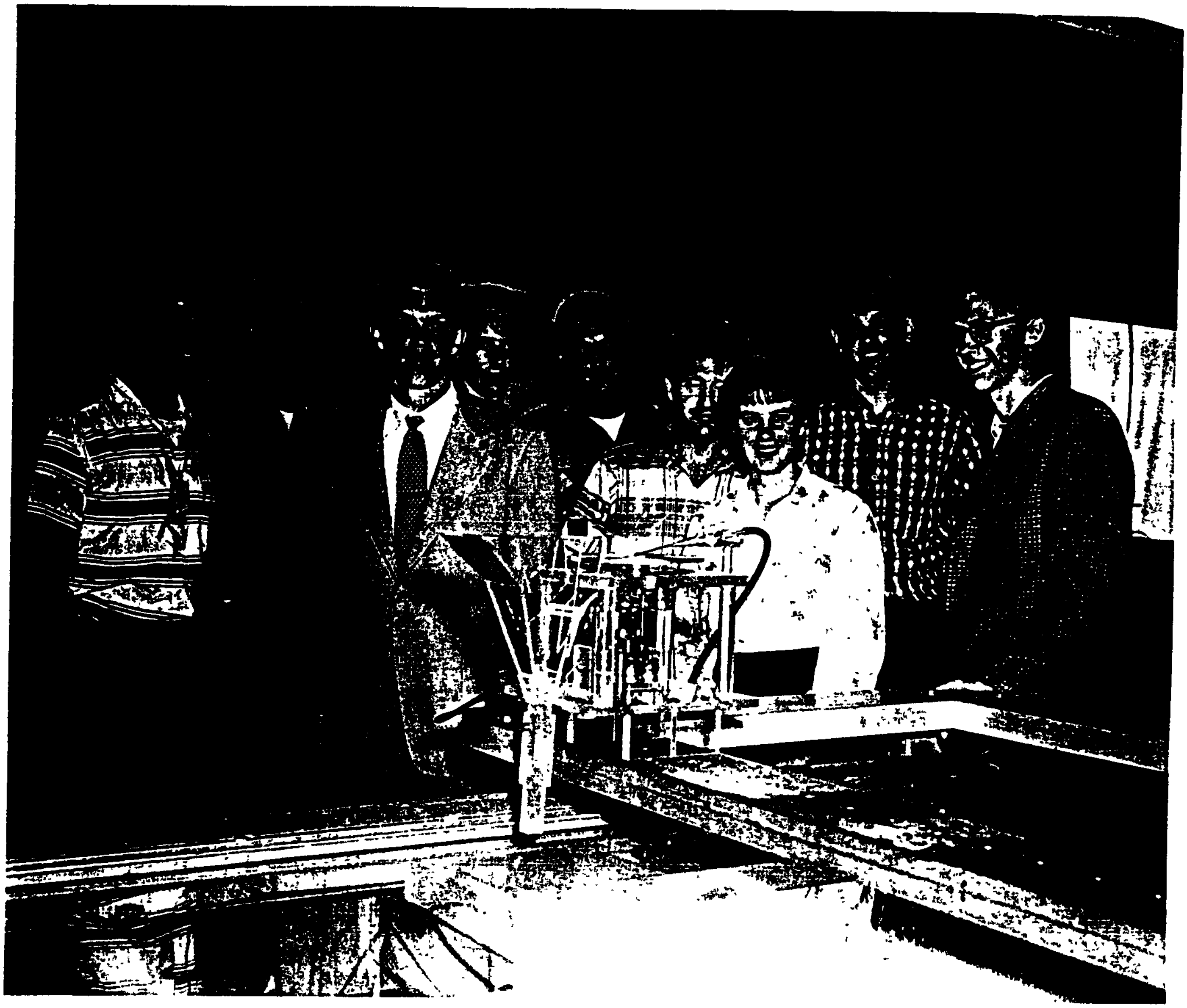
From the very beginning, training of personnel has been encouraged and supported by the Laboratory. Through the years various college level courses in mathematics, physical and life sciences, statistics, handling of radioactive materials, symbolic logic, conference leadership, nomography, supervision, even one in Russian, have raised the standards, and competence of Laboratory personnel. Regular meetings of individual units for pooling knowledge and discussing problems incurred by this relatively new field of atomic defense began with the Laboratory's inception. One of the first of these, held in 1948, tackled the relation of atomic warfare to conventional warfare. A continuing branch and division seminar program in all facets of work, with both visiting and Laboratory speakers has brought individual members up to date on new developments in their specific fields of research as well as local achievements. A monthly meeting of Laboratory military officers, begun in 1957, featured a lecture by a member of the scientific staff to keep them informed of unit programs and accomplishments.

Management seminars in 1952 and again in 1955 included supervisors down to the branch head level. In 1954 the Scientific Director initiated his Colloquia, and each year from three to six of these important meetings keep the staff informed of the progress of current and long-range programs and other events of general scientific interest to them. Also in 1954, four members of the Management staff attended the Comptrollership-Navy Industrial Fund Courses in Philadelphia to enable them to give more effective service to management in initiating the NIF program. Courses held in Washington and attended by different members of NRDL were the Navy Comptroller Seminars and the Industrial Relations Institute. In 1958 two NRDL representatives participated in each of the two Industrial Relations Field seminars at Alameda Naval Air Station. A Passive Defense training course divided into four parts - Disaster Psychology, Emergency Action to Save Lives, Radiological Safety in Atomic Defense and Fire Fighting - was presented in September 1955 by Laboratory medical doctors. On several occasions selected members of the Laboratory have completed advanced and instructors' courses in First Aid.

TRAINING OF OTHERS

In addition to instruction of its own staff, the Laboratory has contributed significantly to the knowledge of other people. A full scale atomic defense training exercise was conducted by NRDL for 150 civilians

A group of Co-Op students



at the Nevada Test Site in April 1955. The following year and again in 1958, task force monitors were trained for Operations REDWING and HARDTACK by The Health Physics Division.

The NRDL summer employment program, begun in 1955, adds about 50 people to the work force each summer. These include college students, graduate students and faculty members. The Laboratory Co-Operative Education Program, started in 1957 with ten high school graduates, now has 20 enrollees in the Scientific Department. It provides for at least two years of full educational assistance, with alternate periods of study in a university and work in the Laboratory. Both of these programs have brought "new blood" into the Laboratory and provide good future recruitment material. Laboratory support of individual college education also has produced a number of academic degrees that enhance its prestige and calibre of work.

Under the category of training also may be included the annual indoctrination of student officers from the Naval Post-Graduate School at Monterey, California; of active and reserve medical and dental officers as part of training in the military aspects of atomic warfare; of reserve officers on annual duty assignments and on occasion of special groups, such as the Nucleus Port Crew #1, who might be faced with radiological situations in setting up advanced bases in time of emergency.

SEMINARS -- SYMPOSIA -- CONFERENCES

Meetings held at NRDL

The regular meetings of individual Laboratory units have been supplemented from time to time with larger gatherings, in some cases bringing in personnel from many outside organizations. The first recorded Laboratory-wide seminars were held in October 1951 on data obtained from Operation GREENHOUSE. Another of the earlier meetings was a nuclear science instrumentation symposium. In 1953 and 1954 symposia on thermal injury were sponsored by the San Francisco Branch of the Office of Naval Research. Two very important meetings held late in 1956 were the Shielding and Liver Symposia which drew many distinguished visitors and featured invited papers by scientists from all over the country. An outgrowth of the Liver Symposium is a volume entitled "Liver Function" edited by a Laboratory scientist with contributed articles by him and other members of the Laboratory as well as scientists from other activities.

The year 1956 also marked the graphic presentation to selected Laboratory personnel of the program entitled "The Increasing Importance of the Navy."

NRDL was host in October 1957 and again in June 1958 to a large number of professional people who are interested in solving problems of disaster. Sponsored by the Commandant, Twelfth Naval District, this 3-day conference covered medical problems of modern warfare and civil disaster. The lectures, delivered in the Laboratory's auditorium on the first two days, were followed by field demonstrations on Treasure Island. NRDL also has participated for three years in a special course for Air Force inactive Reserve Medical Officers in the medical aspects of special weapons and radioactive isotopes. In January 1958 another course for medical officers (on active duty in this case) on atomic, biological and chemical defense was initiated, with plans for its repetition every six months. Part of this is held at the Laboratory, conducted entirely by members of NRDL.

Meetings Held Elsewhere

Laboratory scientists and engineers have made an extremely significant contribution to the sum total of technical knowledge through delivery of papers at meetings all over the world. It is rare indeed for a member of the NRDL staff to audit a meeting. It is probably safe to say that no American scientific organization of any prominence has failed to hear lectures by representatives of the Laboratory, many of them annually or even more often. Some of the meetings at which they regularly appear are those of the American Chemical Society, American Physical Society, Gordon Research Conference, American Association for the Advancement of Science, Radiation Research, Federation of American Societies for Experimental Biology, American Mathematical Society, Operations Research, American Nuclear Society, American Roentgen Society, Radiation Society of North America, American Physiology society, National Electronic Conference, and American Society of Mechanical Engineers.

Attendance at meetings abroad has also afforded them the added advantage of profitable visits to laboratories in different countries to learn of methods and achievements. On two occasions a Laboratory scientist was invited to participate in observations of eclipses of the sun. The first was in July 1954 when his equipment for scientific measurements were set up on Sydkoster Island, Sweden; the other in October 1958 on a small island in the Pacific. The following list gives an idea of the diversity of organizations to which NRDL members have spoken:

International Symposium of Radiobiology	Liege, Belgium
Radioisotope Conference	Oxford, England
Tripartite Conference	London, England
Industrial Engineering Inst.	Berkeley
Technical Publishing Society	Los Angeles

Congress of Biochemists	Brussels, Belgium
Congress on Solar Energy	Tucson, Ariz. and Natick, Mass
Veterinary Radiological Health	Oak Ridge
Vacuum Techniques Symposium	Namur, Belgium
Scintillation Counter Symposium	Washington, D. C.
American Association for Cancer Research	Atlantic City
Special Libraries	Pittsburgh, Pa
International Council of Industrial Editors	Los Angeles
Symposium on the Art of Glassblowing	Corning, New York
International Congress of Pure and Applied Chemistry	Lisbon, Portugal
Western Electronic Conventions	Los Angeles
Genetics Society	Storrs, Conn.
International Congress of Hematology	Boston
Symposium on "Hepatitis Frontiers"	Detroit
Technical Report Writing Seminar	Pennsylvania
Fire Research Correlation Conf.	Washington, D. C.
Conf. on "Prediction on Length of Life in Human Populations Following Exposure to Ionizing Radiations."	Chicago
Animal Care Panel	Chicago
International Ozone Conf.	Chicago
Int'l Cong. on Peaceful Uses of Atomic Energy	Geneva, Switzerland

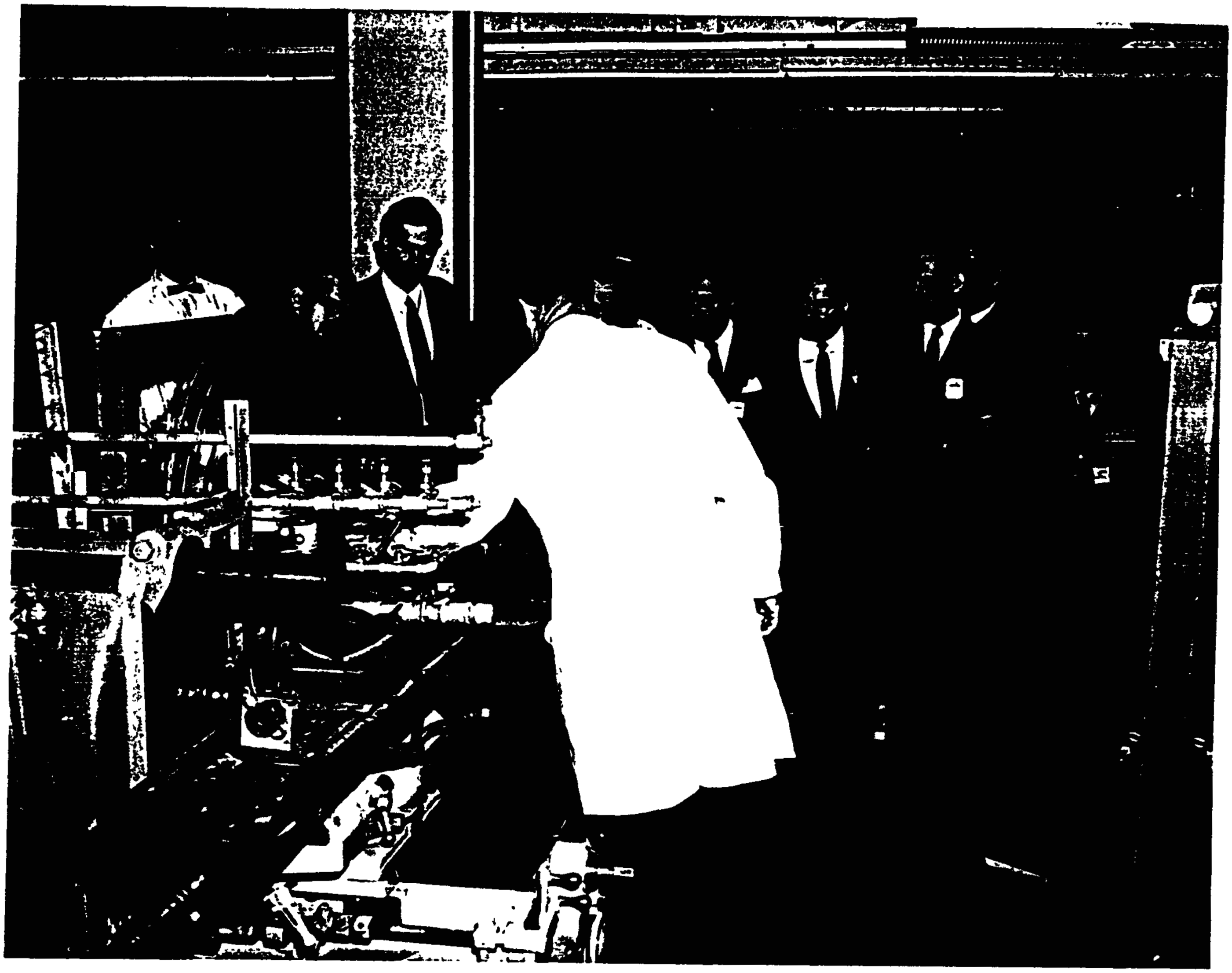
Hearing on Radioactive Waste Disposal	San Francisco
Conf. on Electrical Insulation (Nat'l Research Council)	Boston
AEC- Nat'l Inst. of Health Conf. on Radiation and Aging	Boulder, Colorado
Conf. on Extremely High Temperatures	Boston
Int'l Congress on Microbiology	Stockholm, Sweden
Int'l Conf. on Nuclear Structure	Rehovoth, Israel
Int'l Congress on Military Medicine	Belgrade Jugoslavia
World Health Organization	Geneva, Switzerland
Cold Injury Conference	Fairbanks, Alaska
Atmospheric Transmission of Thermal Radiation	Washington, D. C.
American Medical Association	New York

VISITORS

The Laboratory has been well repaid for its contributions to the success of meetings at other places. Distinguished speakers from far and wide, and too numerous to mention by name, have added to the local store of knowledge in many different fields. These have come from universities, industry, laboratories and other organizations in this country and as far afield as England, Wales, Germany, Sweden, Japan, Denmark, and the Union of South Africa.

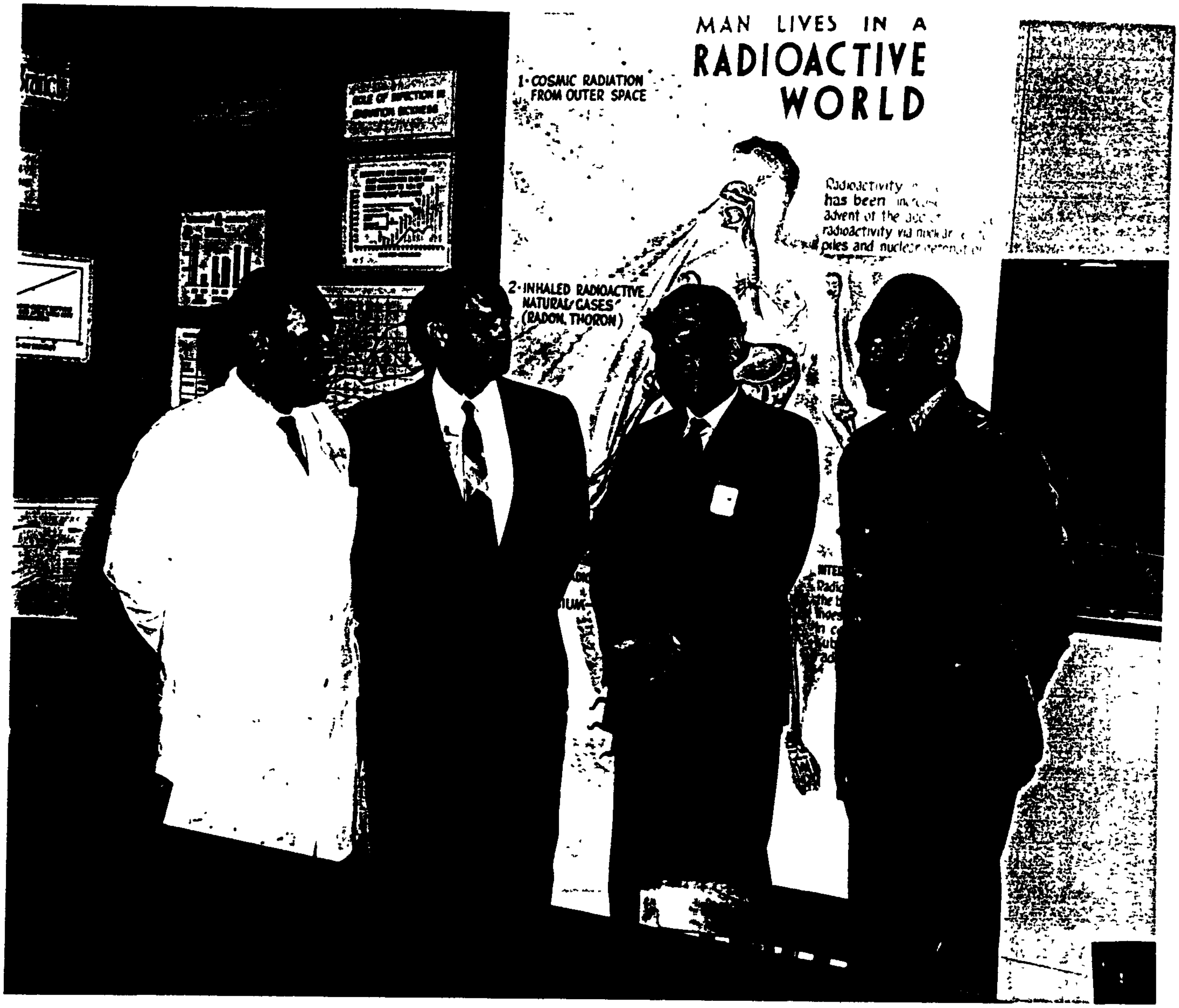
The list of visitors who came not to lecture but to discuss mutual problems or merely to tour the Laboratory might well be pages torn from Men of Science or Who's Who of domestic and foreign governments. Some of the high level committees which have met within the Laboratory walls include the Military Liaison Committee of the Research and Development Board's Committee on Atomic Energy; Advisory Committee on Fiscal Organization and Procedures; Senior Scientists of both East and West Coast Laboratories; Committee on Naval Medical Research of the National Research Council; Advisory Committee on Underwater Explosions;

Congressional group visits Nucleonics Division



Foreign military dignitaries hear explanation of the Model Magnet

Eminent English scientist, second from right, with representatives of Bio-Med Division


MAN LIVES IN A
RADIOACTIVE
WORLD
1·COSMIC RADIATION
FROM OUTER SPACE
2·INHALED RADIOACTIVE
NATURAL GASES
(RADON, THORON)

Chief of the Bureau of Ships talks to key members of the Laboratory

National Committee on Radiation Protection; International Physicians, with representatives from Chile, Ecuador, France, Guatemala, Indonesia, Lebanon, Luxembourg, Paraguay, Portugal, Turkey, Uruguay, and Burma; Joint Defense Planning Commanders; Department of Defense sub committee of House of Representative Appropriations Committee; Defense Advisory Committee on Professional and Technical Compensation; Navy Research Advisory Committee; Civil Defense officials; Navy League; and the Army Technical Services.

The Laboratory has been honored by visits from men high in Government, including Secretaries of the Navy, Dan Kimball and Charles S. Thomas; Under Secretary of the Navy, William B. Franke; Assistant Secretary of the Navy (Air) Garrison Norton; Assistant Secretary of the Navy (personnel) Richard Jackson; and several groups of members of the U. S. Congress.

High ranking military officers who have been briefed on the NRDL program and have seen segments of the Laboratory in operation include: ADM Robert B. Carney, Chief of Naval Operations; ADM Jerauld Wright, Commander-in-Chief, Atlantic Fleet; RADMS Homer Wallin, Wilson D. Leggett, and Albert G. Mumma, all Chiefs of the Bureau of Ships; Major General Lewis T. Heath, Commander, Field Command, Armed Forces Special Weapons Project; ADM Jorge do Paco Mattoso Maia, Brazilian Minister of Marine; RADM Adolfo B. Estévez, Minister of Marine Argentine Republic; RADM G. J. Mackay, Head, Training Command Peruvian Navy; Admiral Rafael B. Richardson, Chief of Naval Operations, Dominican Republic; Commodore Lars Troell, Surgeon General, Royal Swedish Navy; and many others. Suffice it to say that this unique research organization devoted to work of interest to all mankind plays host to over 10,000 visitors a year from literally all over the world.

AWARDS -- COMMENDATIONS -- HONORS

The Laboratory Awards program came under the jurisdiction of the Shipyard until sometime in 1953. No records of any presentations have been located, probably for the reason that no awards were made. In December 1953 the Laboratory's first Safety award for its low accident record, both industrial and vehicular, was presented at a ceremony held in the Shipyard theatre. The industrial safety award has been received every year since that time and the vehicular award in all but two years.

Superior Achievement

The first recorded award for superior work performance was presented early in 1955. At that time it was called an Efficiency Award and was the first and last such award ever made in the Laboratory, for immediately thereafter this award was designated as Superior Accomplishment and divided into several categories, depending on the type of achievement. Since that presentation, 131 superior accomplishment awards have been received by individual members of the Laboratory.

Of the superior accomplishment awards, 32 have resulted from the receipt of the Outstanding Performance Rating. Two honorary awards were received. The first, a Meritorious Civilian Service pin, was presented to a guard, Edward A. Dufault, who rescued a man from possible drowning in a water-filled sump in the Shipyard. The other, the Distinguished Civilian Service award, the highest honor the Navy bestows upon a civilian, was conferred on a Laboratory official, Walmer E. Strope, in recognition of his contribution to concepts of defense against, and recovery from, thermonuclear attack.

Longevity

Although the Laboratory is essentially an activity with accent on youth, a few length of service pins have been earned, the first of these being for 20 years' service in August 1953. Since that time 28 have been issued for 20 years and 6 for 30 years. The comparatively few optional retirements in the twelve year period included two commanding officers, two other military officers and three civilians.

Beneficial Suggestions

In the Beneficial Suggestion field, approximately 1239 were received between 1953 and the end of 1958, with 307 of those accepted and put into operation. During one 5-month period in 1954 NRDL stood second in the number of beneficial suggestions received in all of the Bureau of Ships' laboratories. Annual savings realized from those adopted during that period amounted to nearly $5,000, not to mention the intangible benefits of improved morale and working conditions.

Collective Commendations

The Laboratory as a whole has acquired an impressive number of commendations for group achievements. In 1951 letters of appreciation

came from both the Commanding General and Scientific Director of Operation GREENHOUSE for the "long hard hours, tireless efforts, diligence and hard work" of Laboratory participants that produced such fine results in the military test programs. As an outgrowth of their contributions to the success of the Operation, seven members of the Laboratory received Certificates of Achievement. Following another field operation the participants were commended for rendering "invaluable assistance in collecting recorded data and providing preliminary results for immediate use, at the same time displaying cooperation and willingness and high morale that contributed to the success of the project..."

In 1956 the Chief of Naval Operations sent a message, endorsed by the Commander of the Field Command, AFSWP, expressing his personal congratulations to participants in "this longest and most complex series of atomic tests that could not have been accomplished without the highest type of leadership and the wholehearted cooperation of all hands..."

Commendations have been received for feats other than field operations. "You are doing an outstanding job for the general welfare of the people of the United States and the World"... "Extremely valuable source of information..."

In 1954 the emergency medical team sent by the Laboratory to care for the people accidentally exposed to radioactive fallout following the detonation of an atomic weapon received a glowing commendation from the Commander of Task Force Seven. "... Your broad experience in the field of radiobiology... your constant attention to the work, was a very material contribution and added greatly to the rapid recovery of the patients..."

The Dedication ceremony and subsequent scientific program drew approbation from the visitors one of whom called it a "wonderful tribute to naval organization and resource..."

In June 1957 the Laboratory was honored in becoming a participating member of the International Science Foundation "to advance science and technology and accelerate the development of our scientific resources by increasing the flow of ideas between scientists and engineers throughout the world." Later that year, the Commandant Twelfth Naval District wrote of the Medical Symposium "...the remarkable success was due to the extensive participation of your scientific staff and to the generous logistic support rendered by your command..." The training by NRDL, especially the PLUCON team, of personnel from the Explosive Ordnance Disposal Center in Maryland in monitoring and decontamination procedures brought a letter praising their patience, cooperation and assistance. Early in 1958 the Commander-in-Chief Atlantic Fleet expressed his thanks for a "most interesting and instructive presentation by an able team..."

Individual Commendations

Personal commendations, not classed as awards, were headed by three acts of heroism by Hospital Corpsmen in the Laboratory. Early in 1955 the quick thinking of a corpsman in immediately disconnecting the electric circuit when a scientist inadvertently touched a bare spot on a wire earned a Letter of Commendation with Pendant from the Secretary of the Navy "...His outstanding alertness and sound judgment undoubtedly saved the life of a fellow..." the letter said.

The other two instances occurred outside the Laboratory, but won commendations from the Commanding Officer and Director. In one the corpsman, at great danger to himself extinguished the flames in an automobile on the highway, at the same time directing the motorists in unpacking the luggage compartment and warning them of the dangerous fumes. The other case involved a berserk veteran who attacked a woman with a knife. Although in considerable danger, the corpsman subdued the attacker and saved the woman's life.

Recognition of the increased scientific stature of the Laboratory as well as the personal capabilities of the Scientific Director and Associate Scientific Director came with their advancement, in 1957 and 1958, to positions exempt from the Classification Act and authorized by Congress only for high ranking professionals.

Honors

Other honors extended individual NRDL members in recent years include: appointments to serve on the National Research Council's Committee of Pathological Effects; appointments to head the American Vacuum Society, and the Board of Civil Service Examiners for scientists and engineers; election of the Radiological Medical Director as Fellow of the New York Academy of Sciences; invitation to participate in a select biophysics conference; commendation for solving problems found in an unusual crystal structure found in a warhead; five-year grant for medical research in heart diseases; award of National Science Foundation Fellowship for a year's research at Oxford University Hospital; gold medal presented to Medical Consultant by College of Radiologists; congratulations from the Commissioner of AEC for a report on the compositions, structures and origins of radioactive particles; invitation to represent a university at the inauguration of the President of the University of California; Woman of the Year; Man of the Year; Secretary of the Year; Queen Bee of the Seabees; and a host of others.

IMPORTANT EVENTS

Laboratory Dedication

Six months after the first segments of the Laboratory moved into the new building a formal dedication ceremony was held. The date was 14 October 1955, designated by Special Proclamation of the Mayor of San Francisco as "United States Naval Radiological Defense Laboratory Day."

Before eight o'clock the final touch had been given to the Navy blue and gold flower arrangements throughout the building and every employee was eagerly awaiting the arrival of the two hundred eminent guests. As the Twelfth Naval District Band played outside visitors filled the foyer. These included members of the Press representing major newspapers, wire services, and newsreels. By ten o'clock every seat in the auditorium was filled. The role of drums announced the entry of the Color Guard of the Pacific Reserve Fleet. As the Guard presented arms and the entire assemblage stood at attention, the strains of the National Anthem came from the Band just outside. Presiding over the meeting was the Commanding Officer and Director, CAPT Robert A. Hinners. The main address was delivered by RADM F. R. Furth, Chief of Naval Research. RADM A. G. Mumma, Chief of the Bureau of Ships dedicated the Laboratory "to the service of the world."

Luncheon, served in the cafeteria by women volunteers for the guests and key members of the Laboratory followed the ceremony. In the evening a dinner at the San Francisco Naval Shipyard Commissioned Officers' Mess featured an address by Dr. Luis W. Alvarez, Associate Director of the University of California Radiation Laboratory.

The next day, 15 October 1955, a Scientific Program was given as part of the Dedication. Chairmanned by Dr. Paul C. Tompkins, Scientific Director and Dr. Eugene P. Cooper, Associate Scientific Director, it comprised lectures by renowned scientists from different parts of the country.

Following is the Dedication Program and a list of the Scientific Program speakers and their subjects. (The full texts of these scientific lectures, together with the major Dedication addresses are contained in a Dedication publication attached to this history.)

Laboratory Dedicator RADM A. G. Mumma, and his wife with
Mr. & Mrs. J. J. Mulvaney of San Francisco Navy League

PROGRAM

PRESENT COLORS
San Francisco Group
Pacific Reserve Fleet Color Guard

NATIONAL ANTHEM
Twelfth Naval District Band
Under the leadership of
Chief Musician George L. Briley, USN

INVOCATION
Commander Loren O. Crain, (ChC), USN
Chaplain, San Francisco Naval Shipyard

WELCOME
Captain Robert A. Hinners, USN
Commanding Officer and Director
U. S. Naval Radiological Defense Laboratory

GREETINGS
Honorable James Leo Halley
Acting Mayor, City of San Francisco

MESSAGE
Rear Admiral B. W. Hogan, (MC), USN
Chief, Bureau of Medicine and Surgery

INTRODUCTION
Rear Admiral John R. Redman, USN
Commandant, Twelfth Naval District

ADDRESS
Rear Admiral Frederick R. Furth, USN
Chief of Naval Research

DEDICATION
Rear Admiral Albert G. Mumma, USN
Chief, Bureau of Ships

BENEDICTION
Chaplain Crain

SCIENTIFIC PROGRAM

Dr. Luis W. Alvarez
Professor of Physics, University of California
Associate Director, University of California Radiation Laboratory

"Early Day Experiences with Radiation Hazards"

Dr. Joel H. Hildebrand
Professor Emeritus
Department of Chemistry and Chemical Engineering
University of California
President, American Chemical Society

"How Scientists Work and Think"

Dr. George W. Beadle
Professor and Chairman, Division of Biology
California Institute of Technology
President, American Association for the Advancement of Science

"The Structure and Function of the Gene"

Dr. Leonard B. Loeb
Professor of Physics
University of California

"Some Recent Advances in Basic Gaseous Electronics"

Dr. Robert R. Newell
Professor of Biophysics
Director, Department of Radiobiology
Stanford University Hospital

"What Do Radioactive Isotopes Promise for the Future Practice of Medicine?"

Dr. Charles D. Coryell
Professor of Chemistry
Massachusetts Institute of Technology

"Radiochemical Studies of Shell Effects in Fission"

Dr. F. N. D. Kurie
Technical Director
U. S. Naval Electronics Laboratory

"The Growth of Nuclear Physics"

Open House

The Laboratory has held Open House for staff families and friends on two occasions. Both were invitational affairs. The first, on 24 September 1955, served as a sort of dress rehearsal for the Laboratory Dedication three weeks later. Special exhibits pertaining to all segments of Laboratory work were placed in strategic positions and a regular route was planned to save confusion. Six attractive hostesses, elected by Laboratory employees, welcomed the more than 3,000 visitors in the foyer and guides escorted them through the building.

A similar affair, celebrating the 10th anniversary of the founding of the Laboratory, took place on 17 November 1956. Again displays were offered, entirely different from those the year before, and the event was outstandingly successful. Pressure of an ever increasing work load has prevented a repetition of the event since then.

EXHIBITS

No consideration was given to the matter of exhibits until 1951. In August a display was supplied the Institute of Radio Engineers for an electronic show. It was merely an array of a few instruments such as a dust particle-size analyzer and a high level proportion detector, against a back drop of an atomic burst.

Two exhibits were assembled in 1952. One, in connection with a Civil Defense demonstration, was a collection of radiacs, film badges, pocket dosimeters and protective clothing; the other for Armed Forces Day showed a few pieces of equipment and a rat in a volitional activity cage. Although exceedingly crude, the exhibit led to the Laboratory's being the only agency in the Bay Area asked to provide an exhibit for the Civil Defense Alert America display.

The realization that more requests for exhibits would come, brought into focus the need for a display worthy of the name. That was as far as it went for some time. In 1955 another makeshift exhibit put together for the "Atoms for Peace" show in Richmond won a plaque for excellence. At the same time a request came for a Modern Living exhibition in Oakland, but it could not be filled.

The Dedication of the new Laboratory building brought fresh impetus to exhibit ideas resulting in some 18 temporary exhibits representing most of the different fields of research carried on in the Laboratory.

The design and execution of them was a joint effort - scientists, artists and artisans - though major credit for their production belongs to the Graphic Developments Branch. One exhibit stressed experiments conducted to evaluate radioactivity countermeasures for ships. The original washdown countermeasures system, using a red dye instead of radioactive tracers, and the removal of a protective coating by hot liquid jet equipment were shown, along with the simpler implements such as fire hoses and scrub brushes. A realistic display in miniature represented a typical seaport attacked by a surface detonation while troops and war materials were being loaded and a Navy task force was entering the harbor.

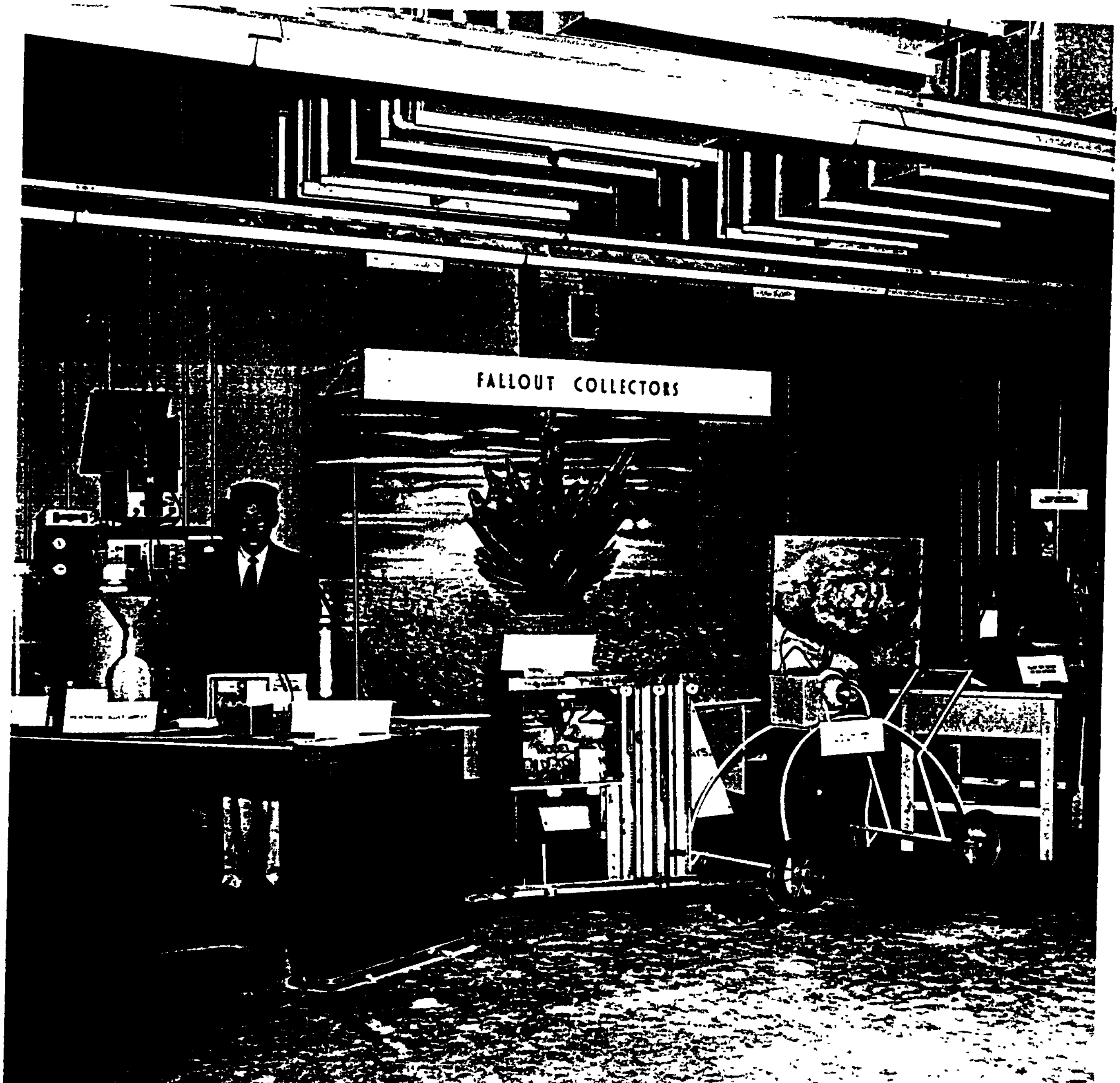
Some of the other displays were: an 8-foot "radioactive man" that showed how radioactive material enters the body by ingestion or inhalation and concentrates in certain organs (this exhibit was used on many occasions); laboratory simulation of the thermal effects of an atomic burst on materials and other demonstrations of thermal sources; methods of shielding against radiation exposure; and various types of equipment, photographs, and charts descriptive of the different areas of research.

The first exhibit, designed to tell the NRDL story for scientific meetings, summarized the import of photographic dosimetry work over five years, and was displayed in December 1955 at the meeting of the Radiological Society of America in Chicago, and in May 1956 to the Health Physics Society at Ann Arbor, Michigan.

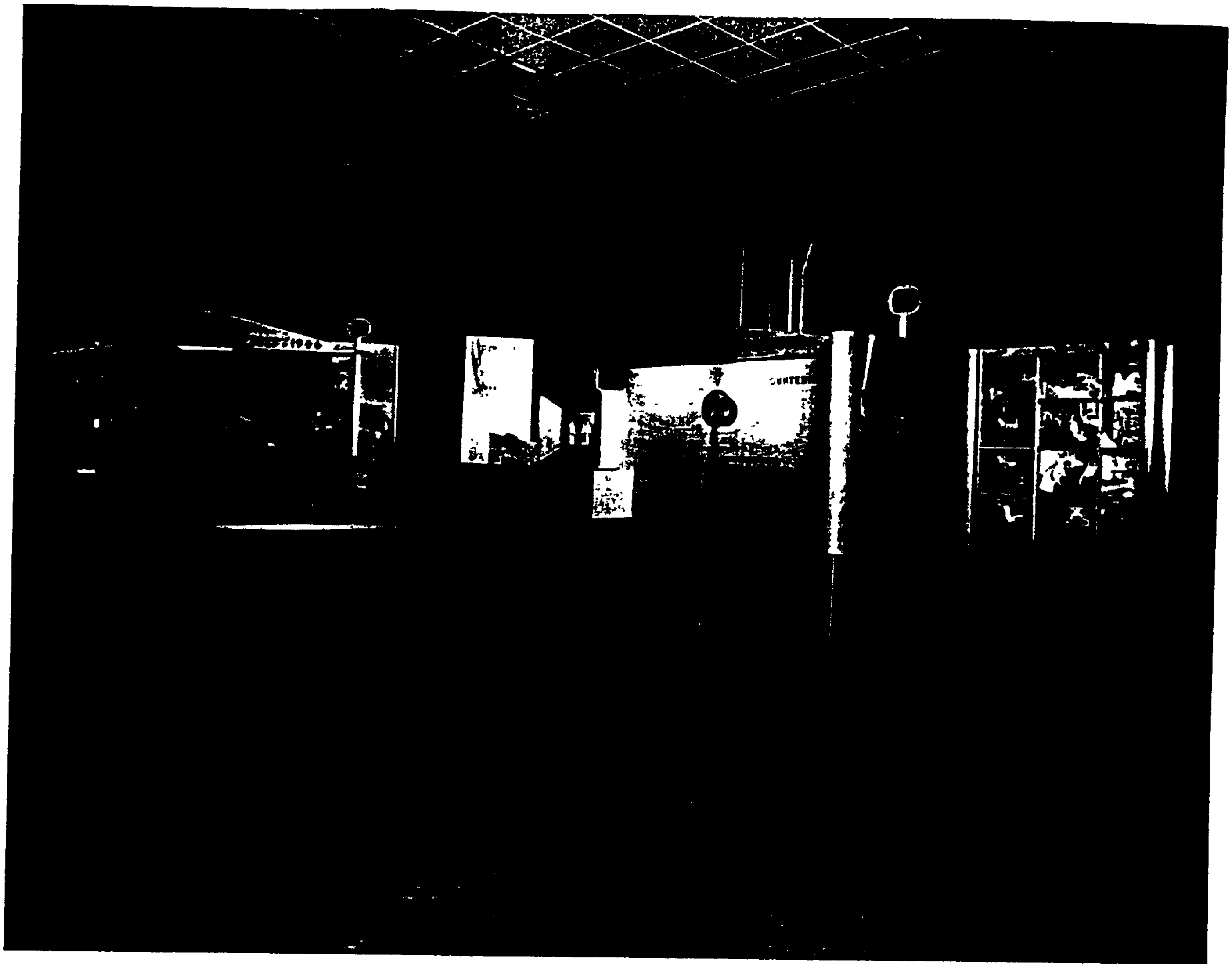
Until an exhibit with more general appeal could be provided, requests had to be filled with more or less impromptu collections. These were provided on two different occasions for Armed Forces Day at Treasure Island and at the Stockton Annex of the Naval Supply Center and for the Solano County Fair. The Radiac exhibit, constructed in 1956, is a dynamically lighted, time sequential display, primarily designed to show the importance of radiac devices in determining the radiological situation following an atomic disaster or operational use of atomic energy. It is composed of four panels decorated with graphic material including captioned photographs and an actual radiac. It has been displayed at different times in the Laboratory, at the Instrument Automation Conference in New York, and at a number of meetings in the Bay Area.

At mid-year 1957 the long-dreamed-of exhibit indicative of all Laboratory work became a reality. It consists of four sections constructed of maple and ash wood, especially selected for the flowing pattern of its grain. As an introduction, color shots of eight different bomb bursts are shown in a shadow box screen set beside a large picture of a target ship used at Bikini in 1946. Subsequent panels locate the Laboratory by map, movie and model of the building, and progress on to the disciplines that go into the Laboratory's work - chemistry, physics and biology. The last section indicates NRDL's relation to the scientific community. The whole exhibit requires 75 feet of wall space and can be

Fallout collectors displayed at Dedication


FALLOUT COLLECTORS

The New Laboratory-wide Exhibit



divided into individual units for smaller showings. Originally intended for display at the Bureau of Ships, this exhibit has been seen on a number of occasions in the Bay Area.

PUBLICITY

During the first five years the Laboratory was "under wraps". Gradually, however, word of its existence was spread, and in January 1951 the first series of articles on its work and personnel appeared in the San Francisco NEWS. From that time on NRDL has been a popular subject for different types of publications, radio and television.

Publications

Two items appeared in the Bureau of Ships JOURNAL in 1953, both dealing with the Laboratory as a whole. An interesting article entitled "Navy Vs the H-Bomb," was featured in COLLIER'S for 23 July 1954, with the cover showing a carrier being bathed with waterspray known as washdown. In a special radiation issue in February 1956, the Office of Naval Research RESEARCH REVIEWS devoted the entire journal to NRDL including certain of the talks given at its dedication scientific program.

Twice in February 1957 the wire services printed news stories based on the testimony by Laboratory personnel regarding the feasibility of providing nation-wide underground shelters to give Americans a high chance of survival of an atomic attack. The second item described the four types of shelters, a plan that is the outgrowth of the Laboratory's responsibility to develop a countermeasures system against the effects of nuclear weapons. A bit later LIFE publicized the shelter idea, using illustrations made in the Laboratory and quoting Dr. Edward Teller as saying the "NRDL is the only place where this problem has been attacked in a consistent and reasonable manner." Press coverage of the NRDL shelter plan has included almost every major newspaper in the country. Also early in 1957 BUSINESS WEEK carried a feature story about NRDL titled "Navy Builds Itself an Atomic Age Lab." that pointed out many features of the Laboratory building and touched on certain experiments being conducted there. Within a month the American Society of Naval Engineers published a talk given at Monterey to scientists and executives by the Commanding Officer and Director, and, later in the spring, Laboratory chemists made headlines on two occasions. A paper describing synthetic fallout studies received considerable attention. The New York TIMES gave it broad coverage and a syndicate serving 400 eastern papers

used the story of the production of ton quantities of synthetic fallout in detail. Shortly thereafter two other chemists found their scientific paper on radioactivity in killer clams the lead article in the science section of TIME.

NRDL has been featured twice inthe Sunday supplement of THIS WEEK. The first article, in August 1957 was titled "A Cure for Radiation Sickness," in which the success of certain experiments was described as "a heartening break-through that may mean the difference between life and death for millions of men, women, and children." The second article in May 1958 "Can Your City Control Atomic Accident?" dealt with the Scientific Director's views on industrial atomic accidents and ways to control them. National publicity given a lecture on the use of meromictic lakes for radioactive waste disposal in January 1955 resulted in numerous requests for copies of the original paper.

Undoubtedly the most thorough over-all coverage of the Laboratory was the work of a former Commanding Officer and Director, CAPT Robert A. Hinners, USN, for the American Society of Naval Engineers JOURNAL (August 1957) replete with photographs, this treatise serves as an excellent reference for many phases of the Laboratory's history, mission and program.

A great many other journals have carried illustrated items describing NRDL, its people, facilities and research. A few of these are SCIENTIFIC MONTHLY, MISSILES AND ROCKETS, Navy League's NOW HEAR THIS, CHEMICAL AND ENGINEERING NEWS, PRESSOGRAM, MANHATTAN LIFE, WASHINGTON ENGINEER, University of San Francisco ALUMNUS, local Sunday supplements, PG and E PROGRESS, and many of the Station publications of other naval activities, such as the Naval Ordnance Laboratory's REPORT. Newspaper coverage has been national as well as local, and is far too voluminous to attempt any lists of individual papers.

Radio

Almost simultaneously with the first newspaper coverage in 1951, several members of the Laboratory participated in a series of nine radio programs titled "The A-Bomb and Your Survival". A year later, seven hospital corpsmen enacted a play to stimulate donation of blood for Korea. A weekly interview with a Laboratory scientist on medical aspects of atomic defense was broadcast in the winter of 1953. With the more popular medium of television taking precedence, the Laboratory was heard on radio only a few more times. One of these was in May 1957 when the Laboratory's countermeasures system was discussed.

Television

The first appearance on television was early in 1952 with demonstration of a portable Geiger counter in connection with Civil Defense. A year later the Navy District Public Information program, "Shootin' the Breeze" featured four members of Bio-Medical division and a dozen experimental mice. In the fall of 1953 the first glassblowing program necessitated transportation of a truckload of paraphernalia to the studio. The glassblower fashioned a number of technical items used in the Laboratory, and while he worked a description of apparatus on display was explained by another member of the Laboratory.

The same glassblower appeared again on television as a part of a "Science in Action" program in 1955. The most comprehensive television coverage of Laboratory activities was the half hour program known as "Success Story" telecast on 16 February 1956. A kinescope of the program was presented by the sponsor to the Laboratory and has since proved invaluable for indoctrination of visitors. It has even been sent on request to other locations for edification of certain students and others who cannot visit the Laboratory. This was quite an ambitious undertaking both for the director and technical crew and the many members of the Laboratory who participated.

In September 1956 CAPT A. R. Behnke, was one of a panel of San Francisco physicians who were targets of a volley of rapid-fire questions on diet by members of the press on "Doctors' News Conference." The subject is one in which Captain Behnke has done exhaustive research, and he was literally the "star" of the show. Much interest was aroused by his presentation of two Laboratory rats being used in an experiment on weight reduction. He appeared again on this program in mid-1957, to discuss "Rocket Age Medicine."

Another medical program featuring a Laboratory member was telecast in October 1956. Entitled "House Call," it was a discussion by three radiologists of invisible rays, the medical uses of X-ray and isotopes and the dangers and hazards of radiation. In April 1958 another of this public series originated at NRDL with seven members of the Laboratory presenting demonstrations and descriptions of their areas of research following an explanation of the harmful effects of nuclear radiation that this Laboratory is seeking to combat. A Laboratory analyst who is an Oxford graduate, appeared on a panel in 1957 that discussed education in the Western World as compared with that of England. Two chemists were featured in a "Science in Action" program the end of October 1958 to explain the many practical applications of the radioisotope in industry, in addition to its use as a source of radiation and in medicine as a diagnostic aid and in treatment of certain types of cancer.

Members of the Laboratory have done exceedingly well in presenting information via television on their lines of work for education of the public. They have enjoyed such roles, but none is ready to desert the lonely laboratory for the hectic life of the studio.

Motion Pictures

The first NRDL motion picture was made in 1951 by Laboratory photographers to show the different types of research being undertaken. The growth and development of the activity since that time renders the film obsolete, and in lieu of a complete film story of the modern NRDL, the kinescope "Success Story" has been substituted. Film coverage of field operations and many experiments is kept current by the Photographic Branch. Late in 1958 sequences were taken in connection with a film entitled "Ship Design for Tomorrow" and sponsored by the Bureau of Ships for recruitment of professional talent for its activities. Shots were made of the Van de Graaff accelerator; the liver perfusion apparatus of Pharmacology Branch; rats being placed in lucite exposure chambers for X-ray; the use of the 36-inch radiation source to ignite a miniature house; and radiac detectors.

Films borrowed from outside the Laboratory have been shown at fairly regular intervals, usually during the noon hour. These have included such subjects as field operations, safety, first aid, security, space, travel, and sports, and of course many dealing with radiation, radiological defense and medical effects, as well as other related scientific themes.

Speakers

Over and above the delivery of papers at scientific meetings, Laboratory speakers both military and civilian have talked at meetings of local non-professional groups such as churches, Rotary, Lions, Kiwanis, and other clubs, high schools and colleges, hospital staffs, public health meetings, Parent-Teachers' associations, lodges, veterans, naval reserves, Boy Scouts, nurses, industrial plants, world affairs council, security councils, and management improvement committees. Accompanied by films, these talks, given outside of working hours, encompass information not only explanatory of the Laboratory and its functions, but also the general subject of atomic energy. In no small way have they contributed to the understanding by the public of the new phenomenon that has changed modern life, but will not necessarily end it.

Sample of NRDL publicity

San Francisco Examiner
AMERICAN PAPER — AMERICA FIRST — AMERICAN PEOPLE
Monarch of the Dailies
SUtter 1-2424
VOL. CCIII. NO. 107 — CCCC* ★ SECTION I — SATURDAY, OCTOBER 15, 1955

NAVY NUCLEAR DEFENSE LAB IS DEDICATED

S. F. Shipyard Unit Hailed as Civilization Bulwark

By WILLIAM MACKEY

The Navy's huge $8,000,000 radiological defense laboratory at the San Francisco Naval Shipyard was dedicated yesterday at ceremonies which drew some of the Nation's top civilian and military nuclear experts.

... the first time ... years as a Navy ... the big ... as one ... "survival of all civilization may depend."

... story window... of labor... staff ... scientists ... nuclear de... the several ... found

Only One——

The laboratory is the only one in the United States, probably in the world, too, whose sole purpose is to study the effects of radiation from nuclear weapons and machines and develop ways to protect people and ...

Rear Adm. Albert G. Mumma, chief of the Navy's Bureau of Ships, officially dedicated the new laboratory before the audience of high ranking Navy, Army and Air Force aides, civilian and university scientists and city and State public officials.

Almost Lost——

The admiral declared that as recently as four years ago the laboratory "was nearly lost and sabotaged by persons who felt there was no danger from radiation.

"Now, even the general public recognizes the very survival of all civilization on this earth may depend on radiological defense," Admiral Mumma said. He dedicated the building "to the service of the world."

Later led by Navy Capt. Robert A. Hinners, commanding officer of the laboratory, and Dr. Paul C. Tompkins, its scientific director, the guests roamed the corridors and research centers.

They inspected the laboratory's 2,000,000 electron volt Van de Graaff generator, a baby atom smasher, climate simulating chambers, radiation shield and waste disposal research projects, radiation measuring devices and the isotope center which measures the effects of radiation on animals, for example.

In the biological and medical ... section they saw how that group of researchers experiment to determine the effects of nuclear and heat radiations on people—and on ways to prevent or minimize the dangerous effects.

In the chemical technology

SHIP RESEARCH—Rear Adm. Frederick R. Furth, left, chief of Navy research, and Rear Adm. Albert G. Mumma, center, chief of the Navy's Bureau of Ships, follow the explanation of blast effect on Navy ship models. The explanation is given by Dr. Paul C. Tompkins, scientific director of the Navy's radiological defense laboratory at the San Francisco Naval Shipyard. Admiral Mumma officially dedicated the $8,000,000 laboratory yesterday.

Lab: Navy Dedicates Nuclear Unit

(Continued from Page 1)

division they saw how technicians searched for ways to combat the radioactive contamination of equipment and to decontaminate affected materials.

The nucleonics division scientists showed the visitors how they experiment for new devices to detect radiation, since radiation is not recognized by the human senses.

In one of the laboratory units they watched as C. Preston Butler, a physicist, duplicated the thermal strength from an atom bomb blast with a high intensity light machine. The beam of light was strong enough to burn a block of wood. Butler displayed burn marks on his arms from experiments where he used himself as a research subject for thermal tests.

A chemical engineer, John C. Sherwin, manipulated mechanical arms and hands inside a protective chamber to mix an aerosol solution of radioactive material which is inhaled by animals to determine its effects on their bodies.

ALL AUTOMATIC.

The guests were shown a "self service supermarket" supply room where the researchers can obtain experiment materials quickly and easily. They gained access to all these places by means of a number of automatic elevators and escalators which make movement through the lab's 282,000 square feet speedy.

Doctor Tompkins, the civilian director, explained his view of the laboratory's function to the guests. Whether dealing with atoms for peace or for war, there always are by-products, he said.

"The mere fact that these by-products are potentially dangerous, the fact that we are committed to exploit the ultimate in nuclear energy means that one must always deal with and control nuclear radiation," he declared.

"We must develop the fine art of living with the atom," he said.

Winding up the day's activities was a dinner for the military and civilian nuclear experts and other scientists.

Dr. Luis Alvarez, associate director of the University of California Radiation Laboratory, was the principal speaker at the dinner. He noted that the new laboratory would serve as the center for research on the decontamination of ships and cities following atomic attacks.

"However, some 300 years from now when atomic weapons will be obsolete, for lack of use, the laboratory will leave its mark in history for its research in the fields of pure science," he said.

SYMPOSIUM SET.

Beginning at 9 a. m. today, a number of other scientists and researchers are scheduled to speak at a symposium to be conducted at the lab with the subject matter mostly about the peacetime aspects of radiation and nuclear energy.

Although the dedication was held yesterday, the laboratory —windowless as a protection against a nuclear attack — actually was completed last spring. The laboratory's activities had been spread out in nineteen buildings around the shipyard ever since it was first organized on a small scale after the Operation Crossroads nuclear explosion at Bikini in 1946.

Other speakers at yesterday's ceremony included Acting Mayor James Leo Halley; R. Adm. B. W. Hogan, chief of the Bureau of Medicine and Surgery and R. Adm. Frederick R. Furth, chief of naval research who told the laboratory personnel: "you have the opportunity to contribute to the general health and welfare of all mankind."

Sunday, Oct. 16, 1955 : CCCC**

Radiation Termed by Scientists Here as Both Scourge and Blessing

By FRANCIS R. O'GARA

Radiation, that mysterious fact of life that became a household word with the advent of the atomic age, was reduced to a paradoxical equation as mankind's greatest scourge and choicest blessing by two eminent scientists here yesterday

To one, radiation holds the cure for cancer — not through clinical application to the patient but through further basic chemical, metabolic and physiological research.

To the other, it holds the foreboding promise of incalculable hereditary genetic damage to your children's children should you be "exposed" to a nuclear bomb attack.

Dr. Robert R. Newell, professor of biophysics at the Stanford School of Medicine and director of the department of radio-biology at Stanford Hospital, spoke on the brighter side of the paradox. But even to him the outlook is none too bright.

"Radiation," he said, "has led from hope to enthusiasm and then through sequels to the trough of disappointment (in the treatment of cancer). . . . The number of things we don't know are legion. . . . The future depends not just on clinical application but on basic research and (there) the sky is the limit."

Doctor Newell noted that expansion in the experimental use of radioactive isotopes, such as radioactive phosphorus, iodine, zinc, chromium, cobalt and gold, has been extremely rapid in the treatment of various diseases but added:

"Radiation per se is not the solution to the cancer problem. . . . I expect isotopes to provide the solution, but only through chemistry and physiology can they give us the real McCoy about cancer.

"When we discover what cancer really is, whether it is one disease or twenty, what makes it grow like wildfire in one case and how it is held dormant for twenty years in another—when we know these things, then we will be in a position to step in and control it in all cases."

For the present, Doctor Newell said, radiation—"like surgery"—is only an expedient in treating cancer. He noted that surgeons "still save only five to ten per cent of those stricken with lung cancer" and: "so far as I know, no lukemia has ever been cured by anything."

He predicted the eventual "breakthrough" may emerge from "something no reasonable person has suspected" and added a jocular touch by observing that perhaps it may even emerge into "a world of political sanity."

Doctor Newell described the use of radioactive isotopes in the treatment of various diseases and mentioned a dye called Rose Bengal, which is used in tests on the liver. He commented:

"These tests on the liver are opening up into attempts to study the portal circulation. This should be of great importance in San Francisco which leads the world, we hear, in per capita consumption of distilled spirits."

Dr. George W. Beadle, president of the American Association for the Advancement of Science and director of the division of biology at the California Institute of Technology in Pasadena, took the darker side of the paradox.

Like Doctor Newell on cancer Doctor Beadle conceded that the hereditary effects of radiation are not precisely known.

But he stated that qualified scientists are generally agreed on these points, among others:

1—Genetic damage can result from very low exposures. . . . This type of damage . . . does not show in the exposed individual and may not show in his children or even in his grandchildren.

2—For most types of genetic damage that result from low doses there is no recovery. The effect is permanent and is transmitted from generation to generation until removed by the slow process of natural selection

3—Most induced changes in heredity (caused by radiation) are recessive or largely so. This means they are not likely to show in the children or grandchildren of exposed individuals. It may be many generations before two like changes come together in the same individual and produce a deleterious effect

Doctor Beadle and Doctor Newell were participating in the concluding session of a scientific program occasioned by dedication of the United States Naval Radiological Defense Laboratory at Hunters Point

More than 200 of America's most distinguished atomic scientists attended the two day observance which was arranged by the Office of Naval Research

Other speakers were Dr Joel H Hildebrand president of the American Chemical Society and emeritus professor of chemistry at the University of California in Berkeley; Dr Leonard B Loeb professor of physics at the University of California in Berkeley, Dr Charles D Coryell former chief of the fission products section at Oak Ridge and now professor of chemistry at Massachusetts Institute of Technology, and Dr. F. N. D. Kurie technical director of the Navy electronics laboratory

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Hunters Pt. Program

SATURDAY, OCTOBER 15, 1955

SAN FRANCISCO CHRONICLE

Navy Dedicates Lab For Radiation Study

People who like their science practical should be pleased by what the Navy did here yesterday.

The Navy dedicated at Hunters Point an $8,000,000 laboratory whose sole task will be to learn how to protect people from radiation following an atomic attack.

"Our very survival could depend on proper radiological protection," Rear Admiral Albert G. Mumma, USN, chief of the Bureau of Ships, declared in dedicating the six-story concrete building.

However, in a dedication banquet speech last night, Dr. Luis W. Alvarez, Associate Director of the University of California Radiation Laboratory, declared that the new laboratory would be chiefly remembered for its contributions to pure science.

DOUBTFUL OF WAR

Dr Alvarez, one of the scientists who observed the dropping of the first atomic bomb at Hiroshima, said he did not believe there would be an atomic world war, so horrible had the weapon become and so readily available to both friend and foe.

He also said he believed the radiation danger from nuclear bomb tests had been vastly overrated particularly as to effects on genetics.

The increase of radiation in the atmosphere due to Nevada tests, he said, was no more than the increase of radiation one would find if he "moved from San Francisco to Denver, which is higher in the atmosphere."

The laboratory itself is regarded as one of the most radiation-proof structures in San Francisco.

To keep out radiation, the air-conditioned building is constructed with an outer wall of practically solid concrete.

Though such construction is scarcely practical for ordinary homes, scientists at the laboratory said there are some sensible steps any one can take to protect himself.

The first is to keep back yards free from inflammable materials

A wooden house, explained Preston Butler one of the laboratory's physicists, can resist a great deal of heat. Its walls may get charred he said, but they won't burn unless there's paper or litter in the yard.

To demonstrate his point, Butler turned on an electric beam with 500 times the power of ordinary sunshine. The beam set a piece of paper afire but it only scorched a [illegible]

ADM ALBERT MUMMA
—'A matter of 'survival'

WATER PROTECTION

Another important point, the scientists said, is that a great deal of radiation can be washed off with running water. The Navy has learned it can help protect ships by flowing a waterfall down their sides during an attack.

Dr. C. R. Schwob, scientific consultant to the laboratory's director, said the Navy hopes to develop a paint which will offer further protection.

The big laboratory has been in operation six months. Its commanding officer is Captain Robert A. Hinners, USN, and its scientific director, Dr. Paul C. Tompkins.

Study Urged On Fallout And Heredity

Geneticists are strongly urging studies to determine just how seriously human beings might be affected by radioactive fall out from such activities as weapons tests and nuclear power plants.

This point and others concerning the problem of protecting people from atomic radiation were brought out yesterday by Dr. George W. Beadle, chairman of the division of biology at the California Institute of Technology.

He spoke at a day-long scientific meeting that was part of the final sessions of a two-day dedication program for the Navy's new $8,000,000 Radiological Defense Laboratory at Hunters Point.

Although geneticists are urging the studies on how seriously genes may be affected by radiation, they "have not advocated stopping nuclear weapons tests," Dr. Beadle added.

Dr. Joel H. Hildebrand of the University of California's chemistry department and president of the American Chemical Society, and Dr. Leonard B. Loeb, University of California professor of physics, spoke in the morning

Dr. Robert R. Newell, director of the radiobiology department at the Stanford University Hospital; Dr. Charles D. Corvell, chemistry professor at the Massachusetts Institute of Technology, and Dr. F. N. D. Kurie, technical director of the Navy's electronics Laboratory in San Diego, were speakers at the afternoon session.

S.F. CHRONICLE
Oct. 16, 1955

SAN FRANCISCO
EXAMINER
Oct. 14, 1955

RADIATION LAB RITES TODAY

The Nation's only laboratory devoted solely to the study of defense against harmful radiation will be dedicated today at the San Francisco Naval Shipyard.

The $8,000,000 installation, known as the United States Naval Radiological Defense Laboratory, is the culmination of work started after the 1946 atomic tests at Bikini, when the embryonic lab was set up to decontaminate ships used as targets.

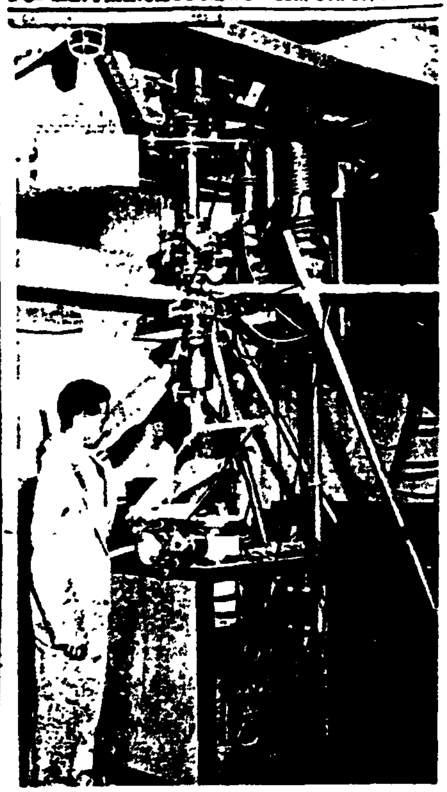
From that beginning in two small rooms at the shipyard where a handful of scientists were employed, the laboratory has grown to a six story concrete structure housing complete equipment for radiation research—including a 2,000,000 volt atom smasher, and employing 600 persons.

Though a direct outgrowth of military operations, the laboratory has a basic mission of providing protection against the harmful effects of all nuclear radiation — thus it is equipped to participate in the development of peacetime applications of nuclear energy.

The peacetime aspects of the laboratory will be the core of a scientific symposium to be held in connection with the dedication. Sessions will be held today and tomorrow in the laboratory auditorium with a number of prominent scientists as speakers.

The dedication ceremonies, starting at 10 a.m., will include an address by Rear Admiral Frederick R. Furth, chief of naval research, and greetings by Acting Mayor James Leo Halley.

6—SAN FRANCISCO NEWS—Sat., Oct. 15, 1955



High-Energy Beam Adjusted

W. E. Kreger, staff scientist at the Naval Radiological Defense Laboratory, adjusts the high-energy beam from a Van de Graaf accelerator, a type of atom-smasher used for research in to the heart of the atom, and generating up to two million volts.

Atomic 'Fire Shield' Group in New Home

Group Seeks Answers to Problems Of Radiation at Hunter's Point

By Jack Loughner

The Armed Forces' "shield against atomic fire," the Naval Radiological Defense Laboratory, has a home of its own at last in the San Francisco Naval Shipyard at Hunters Point.

The existence and operations of the NRDL first were revealed exclusively in The News in 1951, at which time the facility was scattered among some 19 buildings on the shipyard grounds.

Today, however, the lab is concluding a scientific meeting marking the dedication of its new 8 million-dollar plant, a modern six-story building that, from the outside, looks rather like a suitcase stood on edge.

The "shield" description came from Capt. Robert A. Hinners, commanding officer and director of the lab, who presided over formal dedicatory ceremonies that brought a host of top Navy brass from Washington for the occasion.

Proper Defense

Among them, Rear Adm. Albert G. Mumma, chief of the bureau of ships, perhaps best summed up the lab's responsibility when he pointed out:

"The very survival, not only of our civilization, but of all life on earth could depend on proper radiological defense."

And at the afternoon session, Paul C. Tomkins, scientific director of the NRDL, outlined the lab's job in these words:

"We know that to protect against radiation one must have shielding. We know that if radioactive materials fall on the skin they can burn like a hot cinder.

'Not Enough Knowledge'

"We know that these radioactive materials are poisons and will cause pollution of environment.

"For the purposes at hand, this is not enough knowledge. The question is—where is shielding needed—where is clothing needed—are the poisonous properties potentially dangerous enough to food and water to be considered severe, or are they controllable?

"In a word, the main problem is not what to do, but when and under what circumstances should one do it."

To work toward solutions of the problems, the laboratory's six floors bristle with up-to-date scientific equipment that can do everything from "fingerprinting" the atom to testing rats to see how much radiation they absorb from radioactive air and where it's distributed in their systems.

One device, presided over by C. P. Butler, a staff physicist, boosts the beam from an ordinary arc light to an intensity matching that of 500 suns of the energy of ours.

This beam, lasting three seconds, readily sets fire to a piece of paper, but only chars a wooden target.

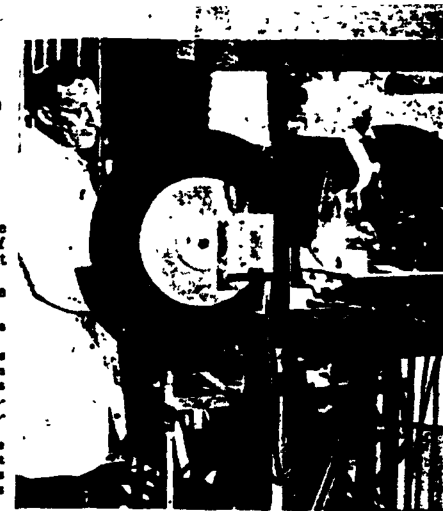
This, explained Claude R. Schwob, a staff scientist, graphically illustrates what civil defense people are talking about when they urge that you get rid of waste paper and similar inflammables.

The energy from Butler's projector is roughly equal to the heat given off by an atom bomb blast a mile or more away. This might char the sides of your house, but it wouldn't set fire to it [illegible] enough "kindling," such as waste paper, for it to work on.

This is but one of the hundreds of research projects carried on by the lab's staff of 515 civilians and 85 military men representing all branches of the Department of Defense.

But finding out how to save lives and property in the event of nuclear war is not the lab's sole function, as Capt. Hinners emphasized at the dedication.

"Tomorrow," he said, "we hope to play a part in harnessing atomic energy for peaceful purposes."



Three-Second Blast of Heat

This machine, operated by C. P. Butler, staff physicist, generates heat equivalent to that of 500 suns and sets fire to a piece of paper but only ch[illegible] small block of wood. Its three-second blast of [illegible] simulates an atomic explosion about a mile dist[illegible]

SF CALL BULL-T[illegible]

New Navy Lab Opened

The Navy today took the wraps off its new $8,000,000 radiological defense laboratory at Hunters Point Naval Shipyard, with the reminder it is dedicated to problems facing the entire world.

The six-story windowless structure was dedicated at ceremonies attended by 300 persons, including scientists and high ranking military officers.

The lab, only one of its type in the United States, will be used to study defense against the harmful effects of radiation on humans and equipment.

Principal speaker was [illegible] Admiral [illegible] USN, chief of naval [illegible]

[illegible]—San Mateo Times
Saturday, Oct. 15, 1955

Navy Opens S.F. Radiological Lab

The new $8,000,000 building which houses the U. S. naval radiological defense laboratory in San Francisco was dedicated today by RADM A. G. Mumma, USN, chief, bureau of ships.

Others participating in the dedication ceremonies were RADM B. W. Hogan (MC) USN, chief, bureau of medicine and surgery; the Honorable J. L. Halley, acting mayor of the city of San Francisco; RADM F. C. Greaves, (MC) USN, Twelfth naval district medical officer; Capt. R. A. Hinners, USN, commanding officer and director of NADL, and CDR L. O. Crain (ChC) USN, chaplain, San Francisco naval shipyard. Catain Hinners is a resident of Burlingame at 1600 Forest View avenue.

Colors were presented by the San Francisco group, Pacific reserve fleet color guard, and [illegible] Twelfth naval district band [illegible] der the leadership of Chief [illegible] [illegible] USN, [illegible] the national anthem.

SAN MATEO TIMES

Radiation Lab Opens in S.F.

10/15/55

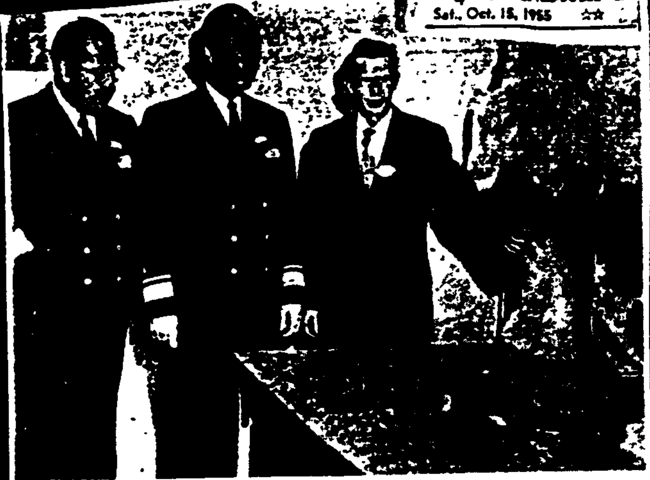
SAN FRANCISCO (AP)—An eight-million-dollar laboratory devoted exclusively to study and development of defense against radiation was dedicated here yesterday by the Navy.

The laboratory is the only one in the country restricted entirely to radiological defense. It is housed in a six-story ultra-modern building with unusually thick walls and no windows.

Defense against "peaceful" radiation as well as against that expectable in war is a major concern of the laboratory, said Dr. Paul C. Tompkins, its scientific director.

The laboratory will start operations almost immediately. It will have a staff [illegible] and 85 military [illegible]

Sat., Oct. 15, 1955



DEMONSTRATION—Dr. Paul C. Tompkins, scientific director of the new Hunters Point Naval Shipyard laboratory designed to study defense against harmful radiation, points out highlights of an atomic bomb exhibit to Rear Admiral Frederick Furth (left), chief of naval research and Rear Admiral Albert Mumma, chief of the bureau of ships.—Call-Bulletin Photograph

S. F. Radiation Lab Dedicated

An $8,000,000 laboratory devoted exclusively to the study and development of defenses against harmful radiation was dedicated yesterday at Hunters Point Naval Shipyard.

The dedication ceremony was attended by 300 persons, many of them scientists and high ranking military personnel.

Speaking of the installation's purpose, Rear Admiral Albert G. Mumma, USN, chief of the bureau of ships, declared:

"It encompasses not just the Navy, not just the three armed services, but the whole world."

ONLY ONE OF TYPE

The six-story windowless laboratory is the only one of its type in the United States.

Defense against "peaceful" radiation as well as against that to be expected in an atomic war is a major concern of the laboratory, Dr. Paul C. Tompkins, its scientific director, said.

As peaceful uses for atomic energy are developed, he said, there will be an increasing need for protecting people against the harmful rays.

BIG PROBLEM

One of the big problems, he added, is diagnosis—to be able to learn what kind of radiation is involved and to determine how much damage it has done or is capable of doing.

The laboratory employs 600 persons, more than half of them scientists and technicians.

In a dedication banquet speech last night, Dr. Luis W. Alvarez, associate director of the University of California Radiation Laboratory, said he does not believe there will be an atomic war.

He pointed out that the weapon has become too devastating and is available to both friend and foe. [illegible]

ALBUQUERQUE JOURNAL
14 OCT. 1955

Radiation Defense Lab To Be Dedicated Today

SAN FRANCISCO (AP)—A laboratory devoted entirely to studying defenses against radiation will be dedicated here today.

Only one of its kind in the country, the new institution is the U. S. Naval Radiological Defense Laboratory. It cost the Navy $8 million.

The modern, windowless six-story building, on the grounds of the Navy shipyard, has been under construction since 1952. Its personnel will be mainly civilian. The military staff will be made up of 85 officers of all branches of the armed services. Of the 515 civilian employes, more than 300 will be scientific and technical personnel.

This project had its start in 1946 at Bikini, when a makeshift laboratory was set up to decontaminate ships used in the atom bomb test of that year.

The big new laboratory will be equipped to participate in studies relating to peaceful uses of atomic energy as well as military uses.

OAKLAND TRIBUNE 10/15/55

Navy Dedicates Huge Radiological Laboratory

The Navy dedicated its huge, new $8,000,000 radiological defense laboratory at the San Francisco Naval Shipyard last night.

The vast 282,000-square-foot building is the only one in the world exclusively devoted to studying how to protect people from radiation injury following atomic attack.

It is also the first time in eight years—since the Bikini explosion—that the Navy has been able to house its many radiological defense experiments under one roof.

And civilian and military alike last night were unanimous in their opinions that the laboratory is destined to make a great contribution toward solving the ultimate secrets of the atom.

STAFF KEEPS BUSY

As several hundred guests toured the six-story, windowless structure of slab concrete and steel, the laboratory's 600 researchers, scientists and technicians went right on with their project tasks.

Rear Admiral Albert G. Mumma, chief of the Navy's Bureau of Ships, officially dedicated the vast installation to "the service of the world."

The admiral observed that as recently as four years ago the laboratory "was nearly lost and sabotaged by persons who felt there was no danger for radiation. Now, even the general public recognizes the very survival of our civilization on earth may depend on radiological defense."

GUESTS MAKE TOUR

Before the dedication banquet, Capt. Robert A. Hinners, commanding officer of the laboratory, and Dr Paul C. Thompkins, its scientific director, led the guests on a tour of the big lab.

At the dinner, Dr. Luis W. Alvarez, associate director of the University of California's Radiation Laboratory, differed slightly with Admiral Mumma by declaring that the new laboratory would be remembered chiefly for its contribution to pure science.

"Some 200 years from now when atomic weapons will be obsolete for lack of use," Dr Alvarez told the banquet guests, "the laboratory will leave its mark in history for its research in the fields of pure science."

Dr. Alvarez said the atomic weapon had become so terrible and so readily available to friend and foe that he did not believe there ever will be an atomic war.

DANGER DISTORTED

The university scientist, one of the observers of the first atomic bomb drop at Hiroshima, also declared he believed that the radiation danger from nuclear tests had been vastly distorted, particularly in the genetic field.

The laboratory itself is regarded as one of the most radiation proof structures in the United States. To keep out radiation, the air-conditioned building is constructed with an outer wall of practically solid concrete.

Inside the laboratory, the study projects are divided into such fields as biological and medical sciences section, the chemical technology division, the nucleonics division and thermal resistance units.

THE WASHINGTON POST and TIMES HERALD
Sunday, October 23, 1955 G11

United Press Photo

A View From the Roof Only

San Francisco, Calif. The new $8-million building of the United States Naval Radiological Defense Laboratory incorporates some unusual structural features. This six-story building of reinforced concrete was designed without windows for maximum protection from atomic detonations. It also provides more usable wall space and reduces construction and maintenance costs. The only view from the building is on a rooftop cafeteria that overlooks the San Francisco Bay.

INFORMAL ORGANIZATIONS

Serving the Laboratory's extracurricular needs are a few groups that, although not included on the organizational chart, still are important to morale.

Welfare and Recreation Committee

Although occasional recreational events were recorded as early as April 1948, no actual committee for such extracurricular activity was formed until 1949. Since that time a committee, at first appointive, but now elected annually by departments, has planned all social events, provided proper remembrance for Laboratory members in time of sorrow and performed other services in similar categories.

Each year it has sponsored a Christmas party and a summer picnic for Laboratory personnel and their families. This Committee has contributed to heightened morale of the scientists, engineers and technicians at the Pacific Proving Grounds by providing athletic equipment, and on one occasion made recordings of family messages which were sent to the Site. They have also made sports equipment available to personnel for noontime diversion and have provided trophies for Laboratory-wide sports tournaments.

WE OF NRDL

In September 1955 the women of the Laboratory held their first regular meeting to select a name and report on by-laws. This organization, of which every woman in the Laboratory is automatically a member, is known as Women Employees of NRDL (popularly called "WE"). Their objective is advancement of good relations, and improved communications, throughout the Laboratory. In addition to their contributions to Laboratory betterment including the gift of a piano, decorating and hostess services, they have provided financial help for needy members, and Christmas gifts for children in hospitals.

Carolers

The Laboratory Choristers, later known as the NRDL Mixed-up Choral Society, was formed in 1952 to bring musical cheer at Christmas. The group, composed of men and women from many segments of Laboratory work, has been active only during the Holidays. They have serenaded workers in different areas of the Laboratory, and during the first few years also sang on the wards of charity hospitals.

Some of the "Girl Fridays" who support the scientific effort

FUTURE OF A LABORATORY

This history attempts to describe in some detail the background, mission, organization and achievements of NRDL. The Laboratory's mercurial development has gone hand in hand with the unfoldment of general knowledge in its specialized fields. Its scientific program is a continuing one that constantly envisions new horizons, with attendant new problems.

Evolving from the original mission for which it was founded are limitless challenges encompassing not only research into means of defense against the destructive elements of atomic energy, but also the broader aspects of the constructive force of its peaceful applications. The Laboratory is ready and eager to meet those challenges wherever they may lead - even into the conquest of outer space!

ADDENDUM

ANNUAL HIGHLIGHTS

Since it is sometimes difficult to place an occurrence properly in time, the following summary of important events or progress in the life of the Laboratory is chronologically listed:

1946 – Laboratory for radiological studies established as activity of BuShips and part of the San Francisco Naval Shipyard.

1947 – Move to Bldg. 506 – Established as Radiation Laboratory of SFNS and separated from the Industrial Laboratory – First sponsors – First Mission defined – Simple organization chart proposed – First Progress Report – Change of Command, LT Preston to CDR Fee – Civilians added to staff.

1948 – Mission restated – First Boards and committees formed – Acquired additional Shipyard buildings – First recorded specific scientific program – Name changed to Naval Radiological Defense Laboratory – First glass apparatus made – Dosimetry program organized – BULLETIN initiated in February as "Technical Director's Bulletin"; changed to "Scientific Director's Bulletin" in October and to "Laboratory Weekly Bulletin" in November.

1949 – First formal organization chart – Laboratory operated as a regular work day on a Saturday to greet the Research and Development Board's Committee on Atomic Energy. Enthusiasm of the Committee resulted in a visit the next week by the Under Secretary of the Navy – Scientific Director appointed to National Committee on Radiation Protection.

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1950 – Made separate activity and name modified to "United States Naval Radiological Defense Laboratory" – New building requested – Assistance with radium spill on Treasure Island – Change of Command, CDR Fee to CAPT Bird.

1951 – Organized into departments -- Field Operations GREENHOUSE, RANGER, BUSTER/JANGLE – Firsts: Laboratory patent, lab-wide seminars, newspaper publicity, exhibit, radio program and Lab movie – New building approved – Change of Scientific Director, Dr. Sullivan to Dr. Tompkins.

1952 – Building 351 completed and occupied – Ground broken for new building – Field Operations IVY, TUMBLER/SNAPPER – Administrative Manual produced – Assistance with nuclear accident at Chalk River, Canada – NRDLERS' Handbook initiated – Wider publicity received – Increased participation in scientific meetings – Bowling and golf tournaments – Carolers.

1953 – Awards program moved from SFNS – Field Operation UPSHOT/KNOTHOLE – First Thermal Injury Symposium – NRDL speakers in demand – First Lab TV program – Guards transferred to NRDL – First Safety awards – Change of Command, CAPT Bird to CAPT Hinners.

1954 – Van de Graaff building completed (Held Open House with 600 visitors) – Field Operation CASTLE (Washdown proved effective) – Provided members for medical team to care for people exposed to fallout in Pacific – Meeting of the National Research Council Committee on Naval Medical Research – Visited by CNO and Chief BuShips and many other high ranking individuals – Bowling team won League pennant.

1955 – Detailed mission defined – Laboratory building completed and occupied – Established as separate command – First Open House – Dedication – Initiation of Scientific Director's Colloquia – Field Operations WIGWAM, TEAPOT – First scientific exhibit constructed – First summer employees – Self-Service Store (later Ready Supply Store) established – First Superior Accomplishment Award – WE of NRDL organized.

1956 – "Success Story" on TV – Field Operations REDWING, STONEMAN – Participation in Congressional Hearings on Civil Defense – Second Open House – 1 Mev X-ray machine installed – Change of Command, CAPT Hinners to CAPT Mandelkorn – Shielding and Liver Symposia – Step-up in TV programs – Accelerated participation in scientific meetings and in numbers of guest speakers – Piano presented by WE of NRDL – Golf tournaments.

1957 – Scientific Director promoted to high level position – Authorized to classify Laboratory positions – Participation in Congressional Hearings on National Shelter Program – Two Changes of Command CAPT Mandelkorn to CAPT Schultz, and CAPT Schultz to CAPT McQuilkin – Co-Op Program initiated – Field Operation PLUMBBOB – First Medical Symposium – Lab-wide exhibit constructed – Marked increase in publications in scientific journals and in papers given at meetings – Publicity received on killer clams, high altitude radiation studies, atmospheric scattering experiments, shelters.

1958 – Associate Scientific Director promoted to high level position – Small changes in mission – Long range planning of research initiated – Field Operations HARDTACK and STONEMAN – Model Magnet and Datatron installed – PLUCON team activated – Plans prepared for facilities to control and monitor laboratory wastes – Negotiations begun for use of Camp Parks areas – Plans for Hydra Series – New irradiation and analyzing equipment acquired – Completion of Vol I of "Radiation and Contamination Control" – Lab played host to several group meetings and many important persons – Awards of NSF Fellowship and Radiological Society Gold Medal – Training emphasized – Provision made for NRDL Fellowships – Pattern of increased publicity sustained.

ENCLOSURES

Chronological record of commanders, with period of service

Brief biography of officer currently in command

Dedication Program

Dedication booklet of addresses delivered at Dedication and Scientific Program

BRIEF BIOGRAPHY OF CURRENT COMMANDING OFFICER AND DIRECTO

U. S. NAVAL RADIOLOGICAL DEFENSE LABORATORY

Captain John Howard McQuilkin, was born in Washington, Indiana but grew up in Baltimore, Maryland. Before entering the Naval Academy he attended Polytechnic Institute and the Severn School. After graduation near the top of the Class of 1935, U. S. Naval Academy, and two years at sea aboard the USS SARATOGA, he began postgraduate study of naval construction at the Massachusetts Institute of Technology. The three-year course culminated in a Master's Degree. This was followed by three years at Mare Island Naval Shipyard, where he worked in Design, Ship Superintendent and Planning Departments. Late in 1943 he was ordered to the Staff of Commander Destroyers, Pacific Fleet as Material Officer. From 1946 to 1950 he was assigned to the Bureau of Ships Hull Design Division, with an additional year as Assistant Director of Standardization in the Office of the Chief of Naval Operations.

Captain McQuilkin had his first contact with atomic energy at the Bureau of Ships, prior to 1950 when engaged in the design of nuclear weapons installations on naval ships. As Deputy Chief of Development (1951 - 1954) Armed Forces Special Weapons Project Field Command, Sandia Base, New Mexico, he was in close contact with nuclear weapons tests which afforded good background for his present assignment.

In April 1955, after a return to Mare Island for a year as Repair and Shipbuilding Superintendent, he was again assigned to Ships Design Division of the Bureau of Ships where he stressed the need for development of design standards to include protection against the effects of nuclear weapons on Navy Ships. His ten years' work in ship design included nuclear propulsion, especially during the years just prior to his assuming command of the Laboratory, when he was intimately concerned with the design of nuclear propelled submarines and aircraft carriers.

Captain McQuilkin received the Bronze Star Medal for World War II service. Since taking command of NRDL he has received a Letter of Commendation with Ribbon and Metal Pendant from the Secretary of the Navy, for achievements in ship design at the Bureau of Ships. His campaign medals include American Defense, American Theatre, Pacific Theatre, Philippine Liberation, World War II Victory, National Defense Service. He is a member of Sigma Xi, the Society of Naval Architects and Marine Engineers and the American Society of Naval Engineers. He is married and has two children.

CHRONOLOGICAL RECORD OF NRDL COMMANDERS

OFFICER - IN - CHARGE

LT Roger G. Preston	2 February 1947	-	2 May 1947

DIRECTOR

CDR John J. Fee	2 May 1947	-	18 July 1950
CAPT Joseph L. Bird	18 July 1950	-	17 July 1953
CAPT Robert A. Hinners	17 July 1953	-	16 Sept. 1955

COMMANDING OFFICER AND DIRECTOR

CAPT Robert A. Hinners	16 Sept. 1955	-	15 August 1956
CAPT Richard S. Mandelkorn	15 August 1956	-	30 July 1957
CAPT Floyd B. Schultz	30 July 1957	-	28 October 1957
CAPT John H. McQuilkin	28 October 1957	-	